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He done done or He'd undone?

An investigation of second language listening processes with a particular focus on the processing of functional morphemes.

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Thesis submitted for the degree of Doctor of Philosophy

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I hereby declare that this thesis has not been, and will not be, submitted in whole or in part to another university for the award of any other degree.

Signature: Nicola Schmidt-Renfree

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Abstract

He done done or He'd undone? An investigation of second language listening processes with a particular focus on the processing of functional morphemes.

This thesis contributes to the research on people's abilities to listen to English as their second language. Language teaching research has suggested that language learners are not taught effectively how to listen in their second language (L2) and there is, additionally, an assumption that language learners will naturally develop their listening skills as their level of proficiency increases. The thesis aimed to show that the latter may happen but that it frequently does not, and there are many competent second language communicators whose listening skills are under-developed. The thesis further aimed to investigate whether specific training methods could facilitate improvements in listening abilities.

The thesis investigated listening at the level of morpho-syntax, focusing on listeners' abilities to recognise co-articulated and weakly stressed function words and functional morphemes. Seven studies were devised to test whether L2 listeners with higher levels of English proficiency have a deficit in recognising functional morphemes when listening, and whether deficits affect listeners' abilities to produce reconstructions of the surface form of spoken sentences they have heard. L2 listeners' results were compared with the results of a number of L1 participants. Levels of accuracy were significantly lower for the L2 listeners, even for those whose language levels were categorised as proficient (CEFR low C2). In the final two of the seven studies, L2 case study participants received training which drew their attention to co-articulations and weak stresses in spoken sentences. Training also included attention to a complex grammatical structure which had previously proved problematic for the listeners to produce.

Post-training tests showed that training had had a positive effect on the L2 listeners' abilities to recognise function words, functional morphemes, and the relevant complex grammatical structure. Implications of the training were discussed in the wider context of second language acquisition, language teaching, and psycholinguistic research.

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Chapter 1 - Introduction

1.1 Background

In an increasingly globalised world, there has recently been a developing interest in how people listen in a second language, with research focusing on a variety of aspects across different domains. This thesis contributes to the research on listening by exploring the ability of second (or third) language speakers of English to recognise functional words and functional morphemes when listening.

Motivation for the thesis

The thesis was motivated by two sets of issues. The first set of issues was anecdotal and based on the concerns of language teachers that they did not know how to successfully 'teach' language learners to develop their listening skills - particularly language learners whose language levels of proficiency were intermediate or higher. These concerns were expressed in the UK by a number of teachers of English as a second language (teachers who were both native speakers and non-native speakers of English) and also by a number of faculty staff presenting at a conference on English language in higher education in Al-Zawia, Libya in 2013. In addition to such reports by teachers of English, reports from learners of English, even those at higher levels of proficiency, showed that they had issues with understanding people when listening in real time, and that they felt that first language speakers of English (English as an L1) often spoke very quickly. (The term L2 is used hereafter to refer to anybody who speaks English as an additional language, whether it be their second, third or fourth language.)

The second set of issues was based on a review of the language teaching literature, which found researchers into English Language Teaching (ELT) claiming that there had been

insufficient research into the processes of second language (L2) listening (amongst others Clahsen & Felser, 2006a & 2006b; Lynch, 2011; Mahmoud, 2013; Vandergrift, 2007). Furthermore, researchers repeatedly stated that teachers of L2 English rarely taught language learners effectively to develop their listening skills in the target language (Chang & Millet, 2014; Field, 2003 & 2008; Liu, 2002; Mahmoud, 2013; Renandya & Farrell, 2011; Rost, 2005; Sheerin, 1987; Vandergrift, 2007; Wilson, 2003). The ELT researcher, Arafat Mahmoud, in his review of the literature on research into teaching listening even claimed that, “Most teachers take it [listening] for granted and believe that it will develop naturally within the process of language learning” (Mahmoud, 2013: 113). The claim that listening is not taught effectively has also been made more recently by researchers such as K  k (2017) and Roussel, Gruson and Galan (2017). The literature further confirmed that L2 listeners frequently report finding the L2 language spoken too quickly for them to follow adequately (amongst others Altenberg, 2005; Buck, 1995; Liu, 2002; Renyanda & Farrell, 2011).

1.2 Review: language teaching in respect of listening to English as an L2

The literature on teaching listening has identified three areas that are relevant to concerns being expressed by researchers in respect of teaching listening to L2 learners of English at intermediate level of proficiency and higher.

Firstly, the most dominant teaching method for English as a Foreign or Second language is a communicative approach, in which the main focus is on communicating meaning with fluency; as a result, language teachers encourage learners to express their views through collaborative activities in the classroom, with the focus being on the communication of meaning rather than on the accuracy of the language form being used (e.g. Alamri, 2018; Cook, 2003; Kennedy & Blanchet, 2014). Materials and classroom approaches towards teaching listening therefore frequently orient around the communicative approach, which draws on listeners’ abilities to utilise general and contextual knowledge to facilitate

comprehension, rather than focusing specifically on accuracy or on analysis of the form of the language.¹

Secondly, what listeners perceive and how they recognise words and parse sentences for comprehension also receives less attention in communicative approaches. In general, sentence comprehension involves several processes: perception of the sounds of the spoken language, recognition of words, analysis of the grammar, understanding of the semantics, and interpretation of the meaning of the sentence within its context. The perceptual stages of processing include not only auditory sensations but also the interpretation of such sensations as meaningful speech sounds (Eysenck & Brysbaert, 2018). Data-driven, perceptual processing is generally referred to as ‘bottom-up’ processing. However, to make sense of a message, the incoming language data needs to be mapped onto the prior knowledge and experiences that the listener has in memory. Processes which utilise prior knowledge and contextual information for message comprehension are generally referred to as ‘top-down’ processing. Roussel et al. (2017:3) define top-down processes in this context as, “modes of information processing that use prior knowledge (stored in the long-term memory) as well as context to build comprehension”. Bottom-up and top-down processes are generally considered to interact in order to ‘speed up’ our comprehension of a spoken message (Andringa, Olstoorn, vanBeuningen, Schoonen & Hulstijn, 2012; Field, 2008; Shang, 2005; Warren, 2013; Weber & Crocker, 2012) and are believed to occur in parallel rather than sequentially (Grosjean, 2013; Marslen-Wilson, 1975; Vandergrift, 2007). On this basis, we can assume an ‘interplay’ between processes. It should be noted that although bottom-up and top-down processes are referred to as separate sets of processes, category boundaries between the two sets are not clear (Roussel et al, 2017).

¹ It should be noted that some grammar teaching does take place, though mainly in a fairly traditional and non-integrative way (Freeman-Larsen, 2015), often taking the form of explicitly taught grammar rules and grammar practice exercises in written and spoken form, generally with a focus on production rather than comprehension.

As Rost (1994) points out in the context of speech, phonemic processing occurs at a slower rate than phonemic production, which leaves a deficit in our perception of the incoming data; therefore, the interplay between bottom-up and top-down processes is essential, as we are reliant on top-down processes to fill in the gaps left by the perceptual deficit. Thus, syllable and word recognition is triggered through perceptual processes and phonological mapping but modified through top-down processes in which prior knowledge and expectations are brought into play. The incoming language data is integrated into our knowledge of what is likely in a particular context, and expectations which are based on our contextual and general knowledge can influence what we think we have heard².

However, once learners have reached an intermediate stage of language learning, activities which enhance perceptual, bottom-up processing and which aid learners to recognise words from the speech sounds produced in connected speech are scarce. In the ELT classroom, bottom-up processing of word recognition is generally neglected in favour of activities that encourage top-down processing (Wilson, 2003: 335), with a tendency amongst teachers to assume that an L2 learner will develop their L2 perceptual listening skills naturally as their mental lexicon together with their ability to speak and read in the L2 develops. We see an example of this in the writing of Ridgeway (2000), who proposed that the more learners were exposed to listening, the more their lower level (bottom-up) skills would develop. Ridgeway writes, “The more listening the better and the sub-skills will take care of themselves as they become automatized” (2000:183). More than a decade on from Ridgeway’s work, we still find researchers such as Renandya & Farrell stating, from their review of the literature, that teachers and listening researchers more often assume that for L2 listeners “perception is a low-level problem that the students can

² Examples of this may be seen in the early experiments of Warren & Warren (1970), in whose experiments participants listened to recordings of a number of sentences, each containing the word *eel* presented as a noun. Immediately prior to saying the word *eel*, the speaker coughed. Warren & Warren found that their participants mostly did not notice the position of the cough, if they noticed it at all; however, participants reported hearing *eel* as *meal*, *peel*, *wheel* or *heel* depending on whether the rest of the sentence contained the word *table*, *orange*, *axle* or *shoe*.

deal with on their own” (2011:54). The belief that perceptual listening skills ‘may take care of themselves’ as listeners are exposed to more listening is a fundamental one to the debate on implicit versus explicit learning, which will be explored in section 1.7 of this chapter.

Here we would point out that, according to the ELT researcher John Field, many high-level breakdowns in L2 communication actually originate in perceptual errors related to bottom-up processing. Field claims that the commonest perceptual cause of breakdown in understanding for L2 listeners, especially those with a higher level of proficiency, is problems with lexical segmentation, where listeners are unable to recognise word boundaries and thus unable to recognise the words themselves, even if the words are known (Field, 2003:327). Similarly, Renyanda & Farrell (2011) have shown that when L2 listeners are unable to recognise a word, they fail to comprehend parts of sentences because they become distracted and are consequently unable to process a portion of the succeeding speech. Rost (2014) suggests that this distraction may be due to a temporary processing lapse causing attention to be disrupted when listeners hear speech sounds that they do not immediately recognise and cannot place in the context of a spoken word and, moreover, that disrupted attention places greater stress on the listener.

Both Liu (2002:153) and Renyanda & Farrell (2011) have found that there is a correlation between the difficulties that an L2 listener has in segmenting streams of speech sounds into words and how fast the listener perceives the speaker to be speaking. They explain that when listeners are unable to discern words, they have a tendency to perceive the speaker’s rate of speech as fast. Bosker, Reinisch and Sjerps (2017) conducted an experiment wherein they tested the effect of cognitive load on listeners’ perception of speech and found some evidence that cognitive load can affect listeners’ attention to temporal pulses, consequently causing listeners to perceive speech as faster, through a ‘shrinking of time’ mechanism. That is, ratio of syllable per time unit is perceived to be higher because fewer temporal pulses are noticed. Bosker et al. have suggested that the

effort of listening in a foreign language can cause higher cognitive loads than listening in a native language. Buck (1995) has shown that perceived speech rate is correlated with comprehension success, and that when the perceived speech rate reaches a critical level, comprehension becomes all but impossible.

Thirdly, researchers suggest that there is too much emphasis on the 'product' of listening rather than on the 'process' of listening. The focus in many language classrooms is on engaging L2 listeners in activities that utilise top-down processing for comprehension. McDonough, Shaw and Masuhara (2013:113), for instance, explain in their book on teaching methodology how English language teaching materials encourage listeners to interact with texts through the use of strategies which facilitate top-down processing of the spoken text. In-class strategies for teaching listening favour activities which encourage listeners to: anticipate what will be said in the text before they listen to it, think about answers to questions related to the text both before and after listening, engage in reconstructing the text post listening, and to reflect on what they have heard in an attempt to have a more comprehensive understanding of the text. As McDonough et al say, "Like the reader, the [L2] listener is involved, for instance, in guessing, anticipating, checking, interpreting, interacting and organising" (2013:137). In-class activities are thus designed to allow L2 listeners to develop strategies through which they gain an understanding of the overall gist of the spoken text, are able to identify the main points that have been made, and can incorporate some of the supporting details into their reconstructions of the text. However, as Vandergrift (2007:196) points out, teaching listening in this way means that the teacher is still largely focusing on learners providing correct answers on what they have heard, thereby focusing on the 'product' of listening. Field (2008:80) explains that even though teachers may use methods which encourage learners to engage with the text, by focusing attention on post-listening reconstructions and on responses to questions, attention is focused upon the product of listening. Therefore, according to Field, teachers do not gain insight into the processes by which the learners in their classroom derive the correct answers. As teachers' main tendency is to

check what the L2 listeners can say about the text and not how the learners have arrived at their responses, teachers do not know to what extent each individual learner has decoded the speech, to what extent they have relied on their knowledge of context to guess about what was said, nor to what extent their reconstructions of the text have only been possible through input from others.

In conclusion, contributing to a possible deficit in effective teaching of L2 listening at the intermediate to advanced levels of proficiency is a lack of classroom focus on helping listeners to develop their abilities to process language form.

1.3 Review: the components of sentences

1.3.i. Words, clauses and phrases

Sentences, whether written or spoken, comprise lexical items organised in certain patterns. While language teachers tend to use the term 'word' to describe the lexical items in a sentence, linguists at times prefer to use the term 'lexical item', as this includes items such as, compound words where a new lexical item is created from two words (e.g. townhouse, windmill or blackbird), and clitics where a word is reduced and attached leftwards onto the previous word (e.g. *don't*, *he's* or *could've*).

Sentences in English are organised into clauses, with each clause containing a grammatical subject and a main verb. A simple sentence has one independent clause, for example,

-Tim lives in the house on the corner.

-Sally is Tim's sister.

-Alice was adored by her siblings.³

³ The grammatical subject of a clause may be the same as the agent. However, subject and agent may differ as they do here, where 'Alice' is the grammatical subject of the sentence and the agent is 'her siblings'.

A compound sentence has two or more independent clauses which are joined to create one sentence. They are typically joined by coordinators (e.g. *and, but, so, moreover, however, therefore*, etc.). Examples of compound sentences are,

- Tim lives in the house on the corner, and he has a sister.*
- Sally doesn't like period dramas on TV, but she often watches them in the cinema.*
- The woman with long black hair sat on the sofa watching TV; meanwhile, the shed in her garden burst into flames.*

A complex sentence contains an independent clause and one, or more, dependent clauses. A dependent clause cannot stand alone but needs to be linked to an independent clause to make sense. Examples of complex sentences include the following,

- Because he was ill, **he didn't go to school.***
- If she hadn't eaten so much ice cream, **she would have eaten the lunch** that he had cooked for her.*
- The doctor**, who was very competent, **instantly diagnosed the problem.***

The independent clauses in the examples above are written in bold.

Words in English are generally grouped into five main word classes: nouns, verbs, adjectives, adverbs, and function words. However, word classes may be further subdivided. Adverbs may be divided, for instance, into adverbs of manner (e.g. they laughed *loudly*), adverbs of frequency (e.g. they laughed *frequently*, they *rarely* cried), adverbs of place (e.g. *everywhere, above, there, into, through*), time (e.g. *later, recently*), degree (e.g. *almost, very, nearly, enough*), and sentence adverbs (e.g. *Unfortunately*, they were unable to stop the leak; *Hopefully*, he'll arrive on time.). Function words are also divided into different types, such as: articles (*a/an, the*) and determiners (*this, those*), auxiliary verbs (he *has* walked, *did* she walk), modal verbs (she *might* go, he *would* walk), conjunctors and

subordinators⁴ (e.g. *and, but, because, in order to, if, unless*), and prepositions (*on, inside, etc.*)^{5, 6}.

The terms used here to label the grammatical categories of words are from traditional grammar, which originates from the description of classical languages such as Latin and Ancient Greek - languages whose grammar was taken to be models for other European grammars (Yule, 2010). However, grammar may also be described through descriptive approaches, for instance structural analysis and constituent analysis. While traditional grammar describes, and sets, the rules of a language, a descriptive approach aims to describe the structure of a language as it is used rather than as it should be used (Yule, 2010). Structural analysis, according to Yule, looks at the distribution of forms, and involves the use of 'test-frames', that is sentences, or parts of sentences (linguistic structures), with empty slots in them, with an investigation of what may be slotted into the empty slots. Structural analysis shows that slots may be occupied by more than one word. A slot which requires a noun, for instance, may be occupied not just by the noun itself but by the noun and words that modify it – for instance, its article and/or an adjective, giving rise to the use of the term 'noun phrase' rather than 'noun' for the slot filler. For example, *The girl, Alice, and The small, dark-haired girl* are thus noun phrases which can fill the same slot in the sentence⁷.

<u> <i>The girl</i> </u>	<i>looked out of the window.</i>
<u> <i>Alice</i> </u>	<i>looked out of the window.</i>
<u> <i>The small, dark-haired girl</i> </u>	<i>looked out of the window.</i>

⁴ Conjunctions include a group of words that are also considered to be adverbs, namely conjunctive adverbs, such as *however, meanwhile* and *therefore*.

⁵ The same word may be considered as a preposition or as an adverb depending on its role in the sentence. Generally, it is considered a preposition if it is followed by an object, and as an adverb if it is not. For example, in 'He went *inside* the cave', *inside* would be considered to be a preposition; whereas, in 'After feeding the birds in the garden, he went *inside*', *inside* would be considered as an adverb.

⁶ Prepositions are sometimes considered as a separate word class on their own.

⁷ Blake (2008) points out that because a pronoun could be used instead of a noun, it would be more accurate to use the term 'nominal phrase' instead of 'noun phrase'.

Constituent analysis typically determines how words combine to form phrases – in other words, how smaller constituents are combined into larger constituents (e.g. Yule, 2010). For example, a constituent analysis of the sentence below,

An old man brought a shotgun to the wedding.

would combine the smaller constituents into the larger constituents (or structures) of:

noun phrases:	<i>an old man, a shotgun, the wedding</i>
a prepositional phrase:	<i>to the wedding</i>
a verb phrase:	<i>brought a shotgun</i>

(The example for the constituent analysis was taken from Yule, 2010:88)

In this way, it is possible to see what kind of constituent structures can be substituted for one another.

In addition to noun phrases, constituent analyses usually involve the following types of phrases:

- prepositional phrases that start with a preposition followed by a noun phrase (e.g. *in the box*)
- adjective phrases that consist of an adjective and its modifiers (e.g. *very loud*)
- adverb phrases that consist of an adverb and its modifiers (e.g. *extremely carefully*)
- verb phrases that explain what someone did/does (e.g. *bought a book; plays his harp beautifully*).

By using brackets, it is possible to show how phrases fit together in a sentence and how phrases can be structured within phrases, as below:

The handsome elderly man walked into the lighting store and bought an extremely expensive crystal lamp. He very carefully put the crystal lamp into a large box before carrying it to his beautifully polished car.

Noun phrases:	<i>[The handsome, elderly man], [the lighting store], [an extremely expensive crystal lamp], [the crystal lamp], [a large box], [his beautifully polished car].</i>
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Prepositional phrases: [*into the lighting store*], [*into a large box*].

Adjective phrases: [*extremely expensive*], [*beautifully polished*]

Adverb phrases: [*very carefully*]

Verb phrases: [*walked into a lighting shop*], [*bought an extremely expensive crystal lamp*], [*put the crystal lamp into a large box*]

[*Before carrying it to his beautifully polished car*] is an adverbial clause with a missing subject. Thus, the first sentence is a simple one with two verb phrases but only one subject, whereas the second sentence above is a complex one with an independent clause and a dependent adverbial one.

Presenting constituent parts of a sentence in brackets is useful for understanding syntactic units and may facilitate an understanding of how people process sentences. It further provides a way of understanding ambiguities, for instance in the phrase *The Danish history teacher*, which could be understood as:

[The [Danish history] teacher] – a teacher of Danish history
or as: [The [Danish] history teacher] – a teacher of history who is Danish,

or, for instance in Bever's (1970) much quoted sentence, *The horse raced past the barn fell*, used to demonstrate garden-path sentence processing - here being able to divide the sentence into phrases and clauses clearly shows the existence of the embedded reduced relative clause:

{ [The horse] [raced past the barn] } {fell}

Since the terms used for traditional and descriptive grammar are used in the psycholinguistic literature as well as in the language teaching literature for describing the components of sentences, this thesis similarly uses this terminology.

1.3.ii. Morphemes

A morpheme can be defined as the smallest component of a word that contributes to its meaning and is therefore a minimal linguistic sign (Radford, Atkinson, Britain, Clahsen & Spencer, 2009). Morphemes can be either ‘free’ or ‘bound’ – the former can stand alone as an independent word, whereas the latter need to be attached to another morpheme or string of morphemes (Fernandez & Smith Cairns, 2011; Yule, 2010). *Sew* and *table*⁸ are examples of free morphemes. Examples of bound morphemes are, for instance, the *-s* affixed to a verb (he sews) as the exponent of the third person singular (present tense), and the *-s* affixed to a noun (tables) as the exponent of plurality. Other typical bound morphemes include, for instance, the verb endings *-ed* or *-ing* (*sewed*, *sewing*), adjective endings such as *-ed*, *-ing*, *-ive*, *-al* (*interested*, *interesting*, *impressive*, *comical*), the adverb ending *-ly* (*quickly*), and noun endings such as *-ment*, *-ion* (*excitement*, *exception*).

The most basic free morpheme of a word is referred to as the root of the word (Radford et al., 2009). Free morphemes may be subdivided into lexical morphemes that carry semantic meaning, and functional morphemes that constitute functional words that do not carry semantic meaning, such as articles, determiners, auxiliary verbs, modal verbs, conjunctors, and so on. Lexical morphemes constitute the roots of words that are nouns, verbs, adjectives and adverbs, and it is the words in these four word classes that are referred to as ‘lexical words’ or ‘content words’ because they carry independent meaning, which we term ‘semantic meaning’ in this thesis.

Bound morphemes are affixed to the roots of a word as prefixes (*decode*) or suffixes (*codes*, *coders*) or both (*decodes*, *decoders*) The word *decoders* comprises four morphemes, which are the root of the word plus three affixes: de-code-r-s. In the main,

⁸ It should be noted that a morpheme may comprise more than one syllable, as in the example of ‘table’ or other words, such as ‘kettle’ or ‘ocean’.

bound morphemes serve two different functions in English and can therefore be divided into two categories: derivational morphemes and inflectional ones (Radford et al, 2009; Yule, 2010). Derivational morphemes change the class of a word or change the meaning of a word within one class⁹. Inflectional morphemes denote grammatical elements such as, verb tense for regular verbs (*walked*), verb aspect (*walking*), plurals for regular nouns (*ships*), verb agreement in the third person singular (*she walks*), and so on. It is important to draw the distinction between the two types of morphemes as they serve different purposes - derivational morpheme endings allow one word to be derived from another and contribute to lexicality, and inflectional morphemes subserve morpho-syntactic sentence processing (Gor, 2015). Along with function words, the function of bound morphemes is to serve a grammatical role in sentences. Therefore, bound functional morphemes and function words are often referred to together in the literature as 'functors' (Warren, 2013).

It should be noted that in the case of irregular forms of countable nouns, different functional morphemes may be used to create plurals, such as *-en* added to *ox* (*oxen*) or *-ren* added to *child* (*children*); or the final morpheme may change, for instance as in the plural of *criterion* which is *criteria*; or the singular and the plural forms of the word are the same, as for instance with *sheep*. In the case of irregular verbs, the *-ed* inflectional morpheme is not usually added to create the past tense and the past participle. Irregular verbs usually either change form in the past tense and the past participle, or the past tense and past participle have the same form as the verb in its infinitive form, as in the following:

⁹ The addition of a derivational morpheme may change the class of a word, for example from an adjective to a noun *happy* → *happiness*, or a verb to an adjective *amaze* → *amazing*, or it may change the meaning of a word, for instance from *code* → *coder*, both of which are nouns.

<u>infinitive form</u>	<u>irregular past tense form</u>	<u>irregular past participle form</u>
do	did	done
get	got	got
leave	left	left
swim	swam	swum
hit	hit	hit
put	put	put

Words in the general sense then are constructed of one or more morphemes. For linguists and psycholinguists, however, an issue of definition arises when attempting to determine whether a word with affixes is the same word as the root of the word. To overcome such issues, as mentioned earlier in respect of compound words and clitics, researchers sometimes substitute 'lexical item' (or 'lexeme') for 'word' (Radford et al, 2009). Thus *table* and *tables* may be said to be two word forms of one lexeme, as may *sew*, *sewed* and *sewn* be three word forms of the lexeme *sew*. Such a distinction is useful when considering discussions related to storage and retrieval of words/lexemes during speech production and processing.

The way that morphemes are used varies across languages. Some languages use few bound morphemes, such as Chinese, Vietnamese and some West African languages; others allow many morphemes to be combined to create complex lexemes, such as Turkish, Hungarian, Finish and Swahili (e.g. Radford et al, 2009). Further, there is variation across languages in the use of inflectional systems and the extent to which speakers use inflections to denote grammatical elements, such as verb tense, mood or aspect, gender, gender of nouns, plurality, and case. Moreover, there is variation in the extent to which words can be stripped of their inflections and remain words. In some languages (e.g. Russian, Spanish, Japanese, amongst others) stripping off inflectional morphemes leaves only a word stem which cannot be used on its own and thus constitutes a bound morpheme (Radford et al, 2009: 160).

English is considered to be a moderately 'analytic' language, whose grammar relies on a combination of word order, auxiliary verbs and a moderate amount of bound inflectional and derivational morphemes which are attached to free morphemes.

1.3.iii. *Auxiliary and modal verbs*

As shown above in the adverbial clause *before carrying it to his beautifully polished car*¹⁰, a subject may be omitted from a dependent clause; however, a verb usually may not be (e.g. Blake, 2008). In fact, the lexical/content verb is thought to be the key component to understanding a clause and a sentence. As Bencini and Goldberg (2000) write, the lexical/content verb is assumed to be the main determinant of sentence meaning in most linguistic theories and psycholinguistic models of sentence comprehension.

As mentioned above, there are two types of verbs: content verbs (which constitute the main verb of the sentence) and verbs which belong to the function word class. The function word class verbs include auxiliary verbs and modal verbs, although much of the linguistic literature refers to modal verbs as a sub-group of auxiliary verbs. Auxiliary verbs cannot function on their own but their role is 'to help' the main content verb. The primary auxiliary verbs are *be*, *have*, and *do*. These three verbs are different from modal auxiliary verbs in that they can function both as auxiliaries and also as main (content) verbs in clauses, they require an *s* inflection in the third person singular, and they have progressive and perfect forms¹¹. *Be* is typically used as an auxiliary verb in passive sentences, e.g. *the biscuit was eaten*, and in progressive (continuous) verb constructions, e.g. *she is waiting*. *Have* is typically used in perfect constructions, e.g. the present perfect *he has completed the work*, and the past perfect *he had completed the work*. Moreover, it is used with modal verbs to form a modal perfect construction, e.g. *he would have completed the*

¹⁰ Such adverbial clauses which include the verb in the present participle (ending in *-ing*) are fairly common in English. Adverbial clauses in which the verb is presented in the past participle are also possible, e.g. *Elected* by a large majority of the population, the Prime Minister was easily able to gain approval for his policies in Parliament.

¹¹ *Have* and *do* are content verbs; *be* is termed a copula – all three can be the main verb in a sentence.

work. *Do* is used as an auxiliary to form questions and to insert before the word *not* in clauses that have no other auxiliary verbs, e.g. *Do you play the harp?* or *They do not agree*. Aarts (2013) classifies these three auxiliaries as aspectual auxiliaries (*be, have*), the passive auxiliary (*be*), and the dummy auxiliary (*do*).

Modal auxiliary verbs (also referred to as modal verbs or simply as modals) are used in a number of ways. For example, *will* is used to express a future event; *may* is used both for permission and for possibility; *shall* is often used for intention; *should* is used for recommendations or expectations; *must* is used for obligation and to express plausibility, as in *I don't know whether he likes cats, but I think he must do since he has one*. *Would* is used as the past tense of *will*¹², and to report habits in the past, e.g. *He would always attend conferences when he could*. Moreover, *would* is used to express possibility and probability.

Auxiliary verbs (both primary and modal ones) together with inflectional morphemes are used to express the tense, aspect and mood that are conveyed by verb structures. Aarts (2013:167) explains that English encodes the notion of time both through tense and aspectuality. He suggests that, in linguistic terms, English only has two tenses that can be expressed through the content verb: the present tense and the past tense. The present tense uses the base form of the verb (i.e. the form used in the infinitive), although in English the third person singular requires an inflected -s ending. (The exception is the verb *be* which has several forms.) The past tense is denoted for regular verbs through the inflected -ed ending. Other languages, such as French, may convey the future through inflections, but in English one way of conveying a future event is through the use of the base form of the verb preceded by the modal verb *will*¹³. Other notions of time are encoded through aspectuality and modality (Aarts, 2013).

¹² For example, when reporting what someone has said.

¹³ The future may also be expressed through the use of the present tense and the present progressive as well as through the use of 'going to'

In English aspectuality comprises a progressive aspect¹⁴ and a perfect aspect. The progressive aspect uses the present participle form of the verb, is used to show that events are happening at a certain time, and indicates that they are temporary, e.g. He *is waiting* for the bus; She *was watching* TV when the lights went out. The perfect aspect uses the past participle form of a verb, is used to show that an event happened before a particular time, and that the event is relevant to that particular moment in time (e.g. Aarts, 2013; Blake, 2008). For instance, in the present perfect construction, she *has finished* the task, we see that the task was finished in the past, but the fact that she has finished it is relevant to the present moment, i.e. she no longer has to work on the task. Similarly, the past perfect construction, he *had learnt to read* before he started school, might convey messages that are relevant to the time that he started school, e.g. he had an advantage over other children, or he might have been bored when he started school¹⁵.

The role of modality is to convey messages about possible events that have *not* taken place. Modality is therefore different to the categories of tense and aspect, because it refers to propositions about events that are not currently realised – currently not factual, or currently unreal – and thus may be referred to by the term ‘irrealis’ (in contrast with events that are real and factual – ‘realis’) (Palmer, 2001)¹⁶. Modality then is a way to talk about irrealis, rather than actual events that have taken place - for instance possibility, probability, plausibility, necessity, ability, obligation, or permission. Although the distinction between realis and irrealis does not relate to everything covered under the notion of modality (Palmer, 2001), the term is appropriate for the notions included in this thesis.

¹⁴ The progressive aspect may also be referred to as the continuous aspect.

¹⁵ In the domain of L2 English language teaching, it is not uncommon to hear tense and aspectuality jointly referred to as tense, with teachers and materials suggesting that the list of tenses includes: the present simple, the present progressive (continuous), the past simple, the past progressive, the present perfect simple and progressive, the past perfect simple and progressive, and the future simple (will eat), future progressive (will be eating), future perfect (will have eaten). This broader use of tense is adopted in the thesis.

¹⁶ Palmer (2001) adds that the realis-irrealis distinction is not valid for everything that is subsumed under ‘modality’, but it is useful to use this term in relation to notional features of modality that have been grammaticalised.

Notions of modality in English may be expressed through the use of the subjunctive, although this use is in decline. The use of the subjunctive is typically seen with requests and demands (e.g. he asks that you *be* on time; he demanded that we *be given* priority when boarding the plane), and wishes (e.g. I wish I *were* on a tropical island), and so on. In the main though, in English modality is typically expressed through modal verbs and is highly grammaticalised in this way. Hansen (2005: 220) explains that modal verbs are a means of expressing modality which have undergone a grammaticalisation process, and they can co-occur with most types of verbs to express the basic notions of necessity, possibility or volition. Although there are other ways to distinguish categories of modality, according to both Hansen (2005) and Aarts (2013), a useful way is to distinguish between epistemic, deontic and dynamic modality. Aarts (2013: 174-175) explains these three categories in the following way: epistemic modality is related to knowledge and the conclusions that people draw based on their knowledge (e.g. the plane was due in at 2.30 pm and it's now 2.45, so the plane *must/should have* landed; you *can't* seriously believe him when you know what a liar he is); deontic modality typically relates to actions or events imposed by an authority, including permission (e.g. you *must* finish the task before 5 pm; you *may* sit on the grass; you *can't* park here); dynamic modality typically relates to ability and volition (e.g. I *can't* speak Polish; I *will* help you; he *would* carry your bags for you but he *can't* because he has broken his leg). While English has undergone a grammaticalisation process of modal verbs to express modality, this is not the same across all languages. For example, in contrast to English, in Russian the modal system is not as grammaticalised and modality is more a semantic category than a syntactic one (de Haan, 2002); furthermore, research conducted by Hansen (2005) shows that there are a number of differences between the way that modality is expressed across all Slavonic languages.

1.4 Review: the production of speech

1.4.i. *From concept to sentence*

Speech is a form of communication in which people communicate their thoughts, ideas and other concepts audibly using words as symbols to represent their message. As with all communication, speakers must encode their messages in a way that listeners are able to understand through conventionally agreed norms. It seems generally to be agreed, that when we produce speech, we normally start with a pre-verbal concept or proposition which is then codified mentally by the brain into language before it is articulated out loud as speech. Early work by Garrett (1975 & 1980), amongst others, suggested that the coding process takes place in three phases. In the first phase, appropriate root words are chosen from the mental lexicon¹⁷. In the second phase, the words are ordered into a suitable grammatical structure according to their role in the sentence, and suitable function words along with suitable function morphemes are added so that it becomes clear who did what to whom and when. In the third phase, the words are encoded phonologically – and only then is the sentence (or parts of the sentence) articulated as speech (see Bock & Levelt, 1994; Ferreira & Englehardt, 2006; Garrett, 1975; Garrett, 1980; Warren, 2013). Dell (1986) proposed an interactive activation model, which included four levels involved in planning speech production: the semantic abstract representation of a concept or proposition, the syntactic structuring of the clause or sentence, the morphological organisation, and the phonological level. His model proposes that the activation of network nodes (neurons) (e.g. semantic feature nodes, word or lemma nodes, phoneme nodes) spread their activation to corresponding nodes in speech production and this activation is bi-directional. His model proposed that the stages are not discrete, as there is some evidence that speech errors can occur due to phonological similarity of words and word familiarity biases, which may indicate that the stages of

¹⁷ Loosely speaking, the 'mental lexicon' is said to be a dictionary in our brain that contains the forms and the meanings of words.

speech production interact. Work by other researchers, for instance Caramazza and Miozzo (1997) who investigated tip-of-the-tongue instances, have suggested that syntactic and phonological information are independent; however, Caramazza (1997) has suggested that semantic representations activate both the syntactic network and the phonological network (see also Harley, 2008). Levelt (1999) points out that speech production models tend to agree that speakers select words that are appropriate at the semantic and syntactic levels, retrieve the word's phonological properties, order syllables appropriately for the sentence context, and prepare for articulation. Where the models differ is in how processes at the various phases interact (Levelt, 1999). While it is beyond the scope of this thesis to investigate the cognitive processes of speech production in further detail, it is useful to consider speech production as having a conceptual phase, a phase where sentences are formulated that involves semantic, syntactic, and phonological choices, and a phase of articulation.

Below we present a brief review of two important features of speech production that affect the articulation of words and consequently make it more difficult for L2 listeners to segment and recognise words in connected speech, namely syllable stress, and co-articulation. First we discuss phonemes from which spoken words are created and which are affected by stress and co-articulation.

1.4.ii *The articulation of speech – phonemes*

When we speak, we typically produce a continuously changing pattern of speech sounds interspersed by a few periods of silence. Silences in speech may occur at sentence or at phrase boundaries or as breathing or hesitation pauses. Slight pauses in speech may coincide with punctuation in written sentence production, although this is not necessarily the case. Pauses in fact regularly occur within words but are often missing between words

(e.g. Weber & Broersma, 2012). Thus they do not coincide with the spaces we observe between words in writing.

Speech may be thought of as a code, just as written language is a code. Both comprise patterns of symbols (sounds in speech, and letters of the alphabet in writing) which are combined in established sequences to produce morphemes, and morphemes are combined in established sequences to express lexemes and to create sentences. A major difference between writing and speaking is that lexeme boundaries are clearly marked by spaces in writing; however, the norm in spoken language is to produce a continuous stream of speech wherein word boundaries are not demarcated.

The minimal linguistically contrastive units of sound are commonly known in linguistics as ‘phonemes’ and constitute the segmental aspects of language. Although it is possible for words to be constructed of a single phoneme (for instance the words *a* and *I*), most spoken words comprise a combination of two or more phonemes. Phonemes are thus the building blocks of spoken language as letters of the alphabet are the building blocks of written language.

Languages which have a simple, reasonably direct correspondence between speech sounds and written symbols are referred to as having a ‘shallow orthography’, whereas languages which have many irregularities in the sound-written symbol correspondences are referred to as having a ‘deep orthography’ (Warren, 2013). English is a language which has a deep orthography. For instance, in English, the written letter ‘c’, may be pronounced in four different ways, as seen in the words, *c*ase, *c*ircle, *o*cean, and *c*ello, where c may be pronounced as k, s, sh and ch (/k/, /s/, /ʃ/, and /tʃ/)¹⁸; the written letter ‘a’ is pronounced quite differently in the word *cat* from the word *chalk*; and the ‘i’ in *live* is pronounced in two different ways depending on whether it is being used as a

¹⁸ Symbols from the phonemic alphabet tend to be placed between slashes to distinguish them from symbols used in the traditional alphabet.

verb (*he lives*) or a noun (*our lives*). The English alphabet comprises twenty-six letters, but the English phonemic alphabet comprises forty-four (or forty-five¹⁹) phonemes. Dialect determines use of phonemes, with some individual phonemes not being used in some dialects.

Mechanically, speech is normally produced through a controlled outflow of air from the lungs, through the larynx and along a tube formed of the mouth and nose, referred to as the vocal tract. Most of the airflow in speech is exhaled through the mouth, but some sounds are produced by exhaling through the nose. Different muscles interact to produce changes in the configuration of the vocal tract as we speak, and thus some of the speech organs (articulators) are pulled closer together or further away from each other, creating changes in the airflow (Collins & Mees, 2008). Moreover, the vocal folds (also known as vocal cords), which are contained in the cartilage of the larynx, can be held apart or brought together to stop air flowing through the larynx – the space between the vocal folds is referred to as the glottis (Ashby & Maidment, 2005). By closing the glottis, a glottal stop is produced. It is the way that the airflow is controlled by the glottis and different muscles of the vocal tract that produces the variety of phonemes.

As with the written letters of the alphabet, the main distinction made between phonemes is whether they are consonants or vowels. In spoken language, a consonant is a speech sound in which the airflow is restricted or prevented by a narrowing of the air passageway; a vowel is a speech sound in which the mouth is open during production of the sound and the tongue does not touch the top of the mouth or teeth – in fact there is considerable space between the articulators in vowel production - thus allowing free airflow (Ashby & Maidment, 2005; Collins & Mees, 2008; Yule, 2010). Generally, twenty-

¹⁹ Tables of the phonemic alphabet which include twenty-five consonants, rather than twenty-four, and thus have forty-five rather than forty-four phonemes, include the w sound from *which* and *what* as a consonant sound /hw/ that is different from the /w/ sound of *water* (Celce-Murcia, Brinton & Goodwin, 1996).

four of the phonemes in English are referred to as consonants²⁰ and twenty are referred to as vowels, as shown in table 1 below.

Table 1. The phonemes of the English phonemic alphabet based on a non-rhotic accent from the south-east of Britain. Taken from the phoneme descriptions in Underhill (1994) & Celce-Murcia, Brinton & Goodwin (1996), based on symbols used by the International Phonetic Association to denote speech sounds from Latin-based alphabets.

VOWELS	monophthongs (single vowel sounds)				diphthongs (a combination of two vowel sounds)			
	i: (see)	ɪ (his)	ʊ (put)	u: (too)	ɪə (pier)	eɪ (bay)		
	e (ten)	ə (the)	ɜ: (her)	ɔ: (saw)	ʊə (pure)	ɔɪ (boy)	əʊ (no)	
	æ (hat)	ʌ (but)	ɑ: (car)	ɒ (hot)	eə (pair)	aɪ (buy)	aʊ (now)	
CONSONANTS	p (pen)	b (bee)	t (tent)	d (dent)	tʃ (char)	dʒ (jar)	k (kale)	g (gale)
	f (ferry)	v (very)	θ (thin)	ð (that)	s (sue)	z (zoo)	ʃ (shell)	ʒ (measure)
	m (many)	n (name)	ŋ (king)	h (hat)	l (leaf)	r (red)	w (water)	j (young)

A colon indicates a longer vowel sound. The layout of the chart is based on the popular language teaching phonemic chart for British English created by Adrian Underhill. Underhill (1994; 2005) has based the positioning of the phonemic symbols in line with the distinguishing features of place and manner of articulation.

²⁰ The letters 'c', 'q' and 'x' are not included in the phonemic alphabet table as their sounds are represented by other consonants. We have seen that c can be pronounced as /k/, /s/, /ʃ/, and /tʃ/. q is represented as /kw/ (as in *queen*); x can be represented as /ks/ (as in *box*), as /z/ (as in *xylophone* or *xenophobia*), or as /gz/ (as in *exactly* or *exaggerate*).

Distinguishing features of phonemes

Consonants are distinguished from each other through three main categories of features: place of articulation (where in the vocal tract the air is restricted and the sound is produced), manner of articulation (how the airflow is obstructed), and voicing (whether the vocal folds are vibrating).

Place of articulation relates to the position of the speech organs as they restrict or obstruct the airflow to produce certain sounds – thus the consonant phonemes are grouped as follows:

<i>Bilabial:</i>	produced with two lips: /b/, /p/, /m/, /w/
<i>Labiodental:</i>	produced with the upper teeth and the inner lower lip: /f/, /v/
<i>Dental:</i>	produced with the tongue tip on or near the inner surface of the upper teeth: /θ/, /ð/ (= 'th' of 'think' and of 'that')
<i>Alveolar:</i>	produced with the tongue tip on or near the tooth ridge: /t/, /d/, /s/, /z/, /n/, /l/
<i>Palatal:</i>	produced with the tongue blade or tongue body near the hard palate: /r/, /j/, /ʃ/, /ʒ/, /tʃ/, /dʒ/
<i>Velar:</i>	produced with the tongue body on or near the soft palate: /g/, /k/, /ŋ/
<i>Glottal:</i>	produced by air passing from the trachea through the vocal folds: /h/

Taken from Celce-Murcia, Brinton & Goodwin, 1996:43.

Manner of articulation relates to the extent the airflow is restricted or obstructed. A sound which has a complete blockage of the airflow is referred to as a stop (i.e. /p, b, t, d, k, g/. A sound with a very narrow opening between the active and the passive articulators causing a turbulence in the flow is referred to as a fricative (i.e. /f, v, s, z, θ, ð, ʃ, ʒ, h/. A sound where the airflow is a little less restricted, so there is no rise in air pressure and turbulence is not caused, is referred to as an approximant – this group includes both 'liquids' /l, r/ and 'glides' /w, j/. A sound that is exhaled through the nose (i.e. /n, m, ŋ/) is

referred to as a nasal (e.g. Ashby & Maidment, 2005; Celce-Murcia et al., 1996; Collins & Mees, 2008; Radford et al., 2009). The sounds /tʃ, dʒ/ are known as affricates as they begin as stops and end as fricatives.

The third major distinguishing feature is voicing. This is produced by the vocal folds. As the folds are almost shut, air can be pushed through them under pressure to cause the folds to vibrate (Ashby, 1995; Ashby & Maidment, 2005). This produces a tone that is referred to as 'voiced' (which can be felt as a vibration in the Adam's apple). Some sounds are voiced, and some are voiceless because the glottis is wide open when they are produced. All vowels are voiced, as are fourteen of the twenty-four consonants. In fact, of the twenty-four consonants, sixteen form dyads of identical pairs where the only distinguishing feature between the two phonemes in the dyad is that one is voiced and the other is voiceless. These dyads are shown below:

<u>Voiceless</u>	<u>Voiced</u>	<u>Voiceless</u>	<u>Voiced</u>
p (p <u>e</u> a)	b (b <u>e</u> e)	s (s <u>u</u> e)	z (z <u>o</u> o)
t (t <u>e</u> nt)	d (d <u>e</u> nt)	θ (θ <u>i</u> n)	ð (ð <u>a</u> t)
k (k <u>a</u> le)	g (g <u>a</u> le)	ʃ (ʃ <u>h</u> ell)	ʒ (meas <u>u</u> re)
f (f <u>e</u> rry)	v (v <u>e</u> ry)	tʃ (t <u>c</u> har)	dʒ (j <u>a</u> r)

The sounds of monophthong vowels largely depend on the shape and size of the resonant space in the mouth, which is determined by the opening or closing of the jaw and movements of the tongue. This involves tongue positions, described as: the horizontal tongue position – which identifies which part of the tongue is used (front, centre or back); the vertical tongue position – which identifies how high the tongue is raised towards the roof of the mouth when the sound is produced (high, mid or low); lip positions (rounded, neutral or spread); and the duration of the vowel (long or short) (Celce-Murcia, Brinton & Goodwin, 1996; Underhill, 1994). As mentioned above, all vowels are voiced. As can be seen in Figure 1, diphthongs are a combination of two vowel sounds, as for example the

sounds *ou* in *doubt* /daʊt/, or *ow* in *now* /naʊ/. Diphthongs are written in the phonemic alphabet as a combination of two single vowel sounds; in the traditional English alphabet, they may be represented by two or more letters (as in *doubt* and *now*) or by a single letter as the diphthong /aɪ/ in *drive* /draɪv/ where it is written orthographically as 'i'.

Non-distinguishing features of phonemes

Whilst phonemes may be referred to as the basic segments of language production, phonemes may, however, include different features, which are smaller units than phonemes. As we saw above, place and manner of articulation along with voicing are features that may distinguish one phoneme from another; however, some phonemic features cause variations in the pronunciation of the phoneme but are non-distinguishing. Different non-distinguishing versions of a phoneme are referred to as allophones, and these tend to occur when phonemes are affected by their environment, that is the phonemes that come before and after them (Yule, 2010).

Examples of the allophones of the English phoneme /p/ are the aspirated [p^h] which is accompanied by a puff of air (as in *pot* or *pickle*), and the unaspirated [p] which follows an /s/ (as in *spin*). As Radford et al. (2009) point out, the /p/ sound is unaspirated after an /s/ sound because a voiceless plosive which occurs after an /s/ is generally unaspirated. Radford et al. explain that an allophone may arise when a phoneme becomes syllabic (as in the /l/ sound of *cattle*), which contrasts, for instance with the clear /l/ said at the beginning of a word (as in the /l/ of *least*) – these two versions of /l/ are allophones. Yule (2010:44) gives the example of two allophones of the phoneme /i:/ in the words *seed* and *seen*, where the nasal sound of /n/ causes a nasalization of the /i:/ in *seen*. Ball (2020) points out that allophones may also arise through changes in the length of a sound, for example the /i:/ sound in *seat* is shorter than the /i:/ sound in *seed*. In English, provided the variations in features are non-distinguishing, allophones tend to be accepted as

versions of a particular phoneme – indeed it is probable that most L1 English speakers are not aware of allophonic variations (Harley, 2008).

1.4.iii. *Influences on the articulation of speech – stress on syllables*

An aspect of speech articulation which is fundamental for this thesis is rhythmic stress. Different languages have different rhythms, but the rhythm of English tends to be based on a pattern of stress-timing. That is, it has a pattern of stressed syllables and unstressed syllables, with stressed syllables occurring at roughly equal intervals. The timing of an utterance does not depend on the overall number of syllables but on the number of strong stresses in the utterance, with the weaker syllables being inserted between the stressed syllables without affecting the rhythm (Celce-Murcia et al., 1996). A stressed syllable, compared with an unstressed syllable, receives more energy from the speaker, and the vowels are longer in duration, higher in pitch, louder, or all three (Cutler, 2005). An unstressed syllable, by comparison, is given less energy by the speaker, and vowels are reduced in duration. Moreover, reduced vowel sounds in unstressed syllables may also undergo change and become a more central, and less distinct, vowel sound /ə/, referred to as the ‘schwa’ (Underhill, 1994:62, 72). From a listener’s point of view, stressed syllables are more prominent and audible than unstressed syllables and are therefore perceptually more salient (Ashby & Maidment, 2005; Celce-Murcia et al., 1996:131, Underhill, 1994).

Celce-Murcia et al. neatly demonstrate how unstressed syllables can be added between stressed syllables that are located at regular time intervals. In the example below of cats chasing mice, the syllables CATS, CHASE, MICE are strongly stressed and occur at roughly the same time intervals. The syllables constituting function words and functional morphemes are weakly stressed. Since the occurrences of strong stresses for each sentence is the same, each of the sentences should take roughly the same amount of time to utter.

CATS	CHASE	MICE
The CATS	CHASEd	MICE
The CATS have	CHASED	MICE
The CATS will	CHASE	the MICE
The CATS have been	CHASing	the MICE
The CATS could have been	CHASing	the MICE

(amended from Celce-Murcia et al.,1996:152 – the last sentence is an addition for this thesis).

According to Cutler & Butterfield (1992), content words usually include at least one strongly stressed syllable – thus a one-syllable content word is usually strongly stressed; content words with two or more syllables may also include a syllable with a lighter stress (secondary stress) or a syllable which is unstressed. Syllables representing functional inflected morphemes and many of the function words (functors) are usually unstressed in a spoken sentence. Thus, to maintain the regularity of speech rhythm, L1 speakers of English produce a pattern of strongly stressed, moderately stressed, and un-stressed syllables as they speak.

Stress-timing is not unique to English but is also used in, for instance, Danish and Dutch, amongst others. However, rhythms vary across languages with some languages underpinned by a rhythm referred to as syllable-timed, whereby syllables appear to have a roughly equal time value (Collins & Mees, 2008:131-132). Moreover, in contrast to English, stress may be said to be fixed in some languages (such as French and Bengali) because strong stresses fall consistently on syllables in the same position of each word. In French, for example, stress tends to be on the last syllable (Jiang, 2018).

1.4.iv. *Influences on the articulation of speech – phonemic context and the co-articulation of phonemes*

In connected speech our articulators are required to move from one sound to the next without stopping, and thus words in connected speech are often articulated more quickly than when they are spoken in isolation. As Fernandez and Smith Cairns (2011: 165) explain, in English, speakers produce around 10 to 15 phonemes per second, or about 125 to 180 words per minute; although in conversations, speech can be much faster, reaching up to 300 words per minute.

In order to maintain the speed of speech production, there is a tendency amongst L1 speakers to move their speech organs more efficiently than they would when articulating each phoneme by itself, or indeed each word by itself, through processes of co-articulation (Fernandez & Smith Cairns, 2011). Fernandez and Smith Cairns (2011:161) explain that co-articulation is one of the most important psycholinguistic aspects of speech production, and it occurs because the speech articulators constantly perform motions for more than one speech sound at a time, causing phonological segments to overlap. Co-articulation in English both helps to create the regularity of rhythm in language and is itself – to an extent - a product of it, and it occurs through the modification and elision of phonemes (e.g. Ashby & Maidment, 2005; Celce-Murcia et al., 1996; Collins & Mees, 2008; Field, 2003; Underhill, 1994; Yule, 2010). The articulatory changes to words made in co-articulation are listed by Underhill (1994:60) as: assimilation, elision, vowel reduction, strong and weak forms, liaison, contractions, juncture. Field (2003:329) suggests the modification of words in connected speech occurs through reduction, assimilation, elision, re-syllabification, and cliticization. Although the two authors use slightly different terminology, they are basically referring to the same concepts – essentially, Underhill's concept of juncture relates to Field's concept of re-syllabification; and Field's concept of cliticization, is essentially Underhill's notion of contractions. The types of articulatory changes are explained below.

Assimilation

The example given earlier of the nasalization of the phoneme /i:/ in the word *seen* demonstrates that phonemes may change depending on their environment. This effect is referred to as ‘assimilation’, which occurs when some aspect of a phoneme is taken up in either the preceding or the following phoneme. This may occur through allophonic similitudes, as seen in the example above of the nasalization of the phoneme /i:/, or in the example of the vowel /æ/ sound taking on a nasalized pronunciation before the nasal sound /n/ in the word *pan* (Yule, 2010:47). Assimilation may also be phonemic, as for instance when the /d/ sound of *broadcast* is replaced by a /g/ sound before the /k/ sound (*broad cast* → *broag cast*) (Collins & Mees, 2008:116), or when final word sounds take on the properties of the following sound: for example where /n/ is pronounced as /m/ before an /m/, /p/ or /b/ sounds: e.g. *tin man* → *tim man*, and *in bed* → *im bed* (Underhill, 1994:60); *horse shoe* → *horsh shoe* (Collins & Mees, 2008:117). Moreover, assimilation may occur morphophonologically where the articulation of an inflected morpheme takes on aspects of the preceding (or following) phonemes. This typically occurs in respect of regular past tense verb endings, where assimilation causes the following: when a verb ends in a voiced consonant, the regular past tense *-ed* ending is articulated as the voiced /d/ sound; however, when the verb ends in a voiceless consonant, the regular past tense *-ed* inflected suffix is articulated as the voiceless /t/ rather than the voiced /d/: e.g. for *move* and *view* where /v/ and /w/ are voiced, the inflected *-ed* is pronounced /d/; but after *pass* and *stop* where the final consonant is voiceless, the *-ed* suffix is pronounced /t/ (Celce-Murcia et al.; 1996:252).

Epenthesis

In cases when the final sound of the verb is /d/ or /t/ and a /d/ or /t/ past tense ending cannot be heard, a schwa vowel sound is added between the verb final morpheme and

the inflected suffix, as, for instance with *waited*, which is articulated as *wait /ɪd/*, or *waded*, which is articulated as *wade /ɪd/*. When a sound is added for articulation purposes, the sound addition is referred to as epenthesis. Other examples of epenthesis are given by Celce-Murcia et al. as when some speakers add a /t/ between an /n/ and an /s/ sound, so that *prince* becomes *prints* or *tense* become *tents*; or a /p/ is added (by a few) between the /m/ and /f/ of *comfort* to produce *compfort*.

Intrusion, re-syllabification, cliticization, reduction, elision

Intrusion is a form of epenthesis, but the term is usually discussed in relation to the insertion of the /j/, /r/ and /w/ sounds between two vowel sounds, as in:

- /r/ - vanilla-*r*-ice cream; I saw-*r*-Anne; media-*r*-event; spa-*r*-owners
- /j/ - be-*j*-able; say-*j*-it; my-*j*-own; toy-*j*-aeroplane; play-*j*-a game; tie-*j*-it up; employ-*j*-a professional; the boy-*j*-ate an apple; be-*j*-a sport; cre-*j*-ate; nai-*j*-ive; boy-*j*-ish
- /w/ - blue-*w*-ink; there is no-*w*-art; how-*w*-is it; through-*w*-it all; slow-*w*-and steady; let's go-*w*-on; try to-*w*-understand; gradu-*w*-ate; co-*w*-alition

(Examples taken from Celce-Murcia, 1996:158-167).

Re-syllabification occurs when the final consonant of a cluster of consonants (two or more consonants) at the end of one word is pronounced as the first sound of the following word – this typically occurs when the following word begins with a vowel, e.g. *left arm* becomes *lef tarm*, and *had undone* becomes *ha dundone*.

Cliticization occurs when two words merge together to form one lexical item as one of the words is contracted and reduced to a clitic, e.g. *do not* → *don't*; *could not* → *couldn't*; *he has* → *he's*; *they have* → *they've*; *would have* → *would've*; *they had* → *they'd*; *they would* → *they'd*, *let us* → *let's*; and so on.

Reduction: vowel reduction occurs when vowel sounds are reduced in length, as typically happens in weakly stressed syllables in connected speech so that the syllables may be said more rapidly. This typically happens when vowel sounds are reduced to a schwa, but also, when vowel sounds do not undergo schwa-transformation, for example where *been* is reduced to *bin*.

Elision: 'elision' or 'deletion' is the process of not articulating a sound that would exist in the careful pronunciation of the word. According to Celce-Murcia (1996:163), this typically happens in:

- multisyllabic words, where the middle vowel is unstressed and elided, for instance:

history /hɪstərɪ/ → *histry* /hɪstrɪ/
camera /kæmɜːrə/ → *camra* /kæmrə/

- two syllable words which are articulated as one syllable words, for instance:

suppose /sʌpəʊs/ → *spos* /spəʊs/
police /pəliːs/ → *plice* /pliːs/
correct /kɒrɛkt/ → *crect* /krekt/

- loss of /t/ or /d/ when it is the middle sound of a cluster of three consonants:

exactly /eksæktlɪ/ → *exacl* /eksæklɪ/
hands /hænds/ → *hans* /hæns/

- loss of a /t/ or /d/ sound when this occurs in a word final position and the following word begins with a consonant:

east side /iːst/ /saɪd/ → *eas side* /iːs saɪd/
wild boar /waɪld/ /bɔː/ → *wil boar* /waɪl/ /bɔː/

In the case of clitics, where two words become one item, we find both consonants and vowels being elided, for instance with *could have* /kʊd/ /hæv/ becoming *could've* /kʊ.dəv/, or *they would* /ðeɪ/ /wʊd/ becoming *they'd* /ðeɪd/.

1.5 Review: listening to English as a second language – recognising words

1.5.i. *Word recognition*

There is some evidence that perceptual processes and word recognition processes occur automatically in L1 listening, as the perceived sounds are mapped onto phonological representations, which, in turn, are mapped onto long-term memory traces of syllables and words in the brain (Pulvermüller, 2001).

In respect of word recognition in the L2, there are a number of reasons why an L2 listener may not recognise a word when they are listening. Firstly, they may not know the word. However, even if they know the word, they may misidentify it. As Darcy, Dekydsprotter, Sprouse, Glover, Kaden, McGuire, and Scott (2012) explain, the association between phonological form and meaning may be less well entrenched in the mental lexicon of L2 speakers and listeners, and the level of entrenchment may depend on the level of proficiency. Gor (2015) points out that misidentification of known words may occur when listening, either through inadequate discrimination of phonological contrasts (e.g. *ship* or *sheep* – was it the white *ship* or the white *sheep* in the distance?) or owing to similarity between the form of the words (e.g. did he *compete* or *complete*). Moreover, speed of word recognition seems to be affected by how familiar the word is (its frequency), particularly in relation to words that start with the same phonemes or share many of the same phonemes (its competitors) (Gor, 2015; Harley, 2008) - the more familiar the word (that is the more frequently it has been encountered), the more easily it will be recognised. In contrast, word competitors will slow down recognition²¹. Moreover, a key issue for L2 listeners, is likely to be issues of lexical segmentation.

In respect of competitors, all three of the main recent models of L1 word recognition – the revised cohort model, the TRACE model, and the SHORTLIST model - accept that word

²¹ Examples of competitors are: whisper and whisker; compliment, competent and computation.

recognition is affected by the word's competitors through a 'neighbourhood effect' (Harley, 2008). A central finding of psycholinguistic research is that spoken word recognition occurs incrementally as listeners start interpreting the speech input before they hear the end of a word (Weber & Scharenborg, 2012). This means that multiple word candidates, that are consistent with the incoming language data, are considered as potential word candidates simultaneously, and thus act as 'competitors' which inhibit each other and slow down recognition (e.g. Weber & Scharenborg, 2012). The more competitors, the higher the density of the 'neighbourhood'.

Regarding L2 listeners, there is some evidence that a 'neighbourhood' includes both competitors from the L2 and from the listener's L1 (e.g. Weber & Broersma, 2012). Rüschemeyer, Nojack and Limbach (2008), for instance, found that the German word *tisch* (table) could activate the German word *fisch* (fish) among L2 German listeners with Russian L1, but such activation did not happen for L1 German listeners. Moreover, the density of competitors in the neighbourhood can increase for L2 listeners in cases where they have difficulty discriminating minimal pairs (Weber & Broersma, 2012). For instance, Weber and Cutler (2004) found that English words beginning with *pan-* could also trigger activation of words beginning with *pen-* for Dutch L1 listeners who did not easily discriminate between /æ/ and /e/. In respect of L1 competitor activation for L2 listeners, there is evidence from research by Weber and Cutler (2004) for instance, that the word *desk* spoken in English could trigger the activation of the Dutch word *dekse* (lid) in L2 English listeners whose L1 was Dutch. Similarly, Marian and Spivey (2003) found the word *marker* spoken in English could trigger activation of the Russian word *marku* (stamp) in L2 English listeners with Russian L1s.

Although phoneme recognition has been shown to affect word recognition, there is disagreement as to what extent phoneme recognition needs to take place before word recognition occurs. However, there is generally agreement that word recognition occurs through both bottom-up and top-down processing and, therefore, that context can aid

word recognition, since activation of a field of meaning can cause a set of words to become available and boost the activation level of a word over its competitors, causing it to be more easily recognised (Gor, 2015; Harley, 2008; Warren, 2013). Context here includes the sentence context in addition to the semantic and pragmatic context.

Turning to the issue of lexical segmentation, as claimed by Field (2003), amongst others, lexical segmentation issues may be considerable for L2 English listeners. As Fernandez and Smith Cairns (2011) point out, L1 English speakers produce a fairly continuous stream of speech sounds and do not pause between words when speaking – words are not segmented but run together just as phonemes are – leading to issues of segmentation. When processing sentences, readers are able to identify where words begin and end from the spaces between the words, but listeners do not have the same benefits. L1 listeners are successful in lexical segmentation because they are able to utilise their knowledge of words, their knowledge of syntax and morphemes, their knowledge of phonotactics²², together with phonetic details and rhythmic cues to segment the speech stream (e.g. Altenberg, 2005:327). Research by Cutler and Butterfield (1992), for instance, demonstrates how L1 English listeners may use syllable stress in the process of segmenting audible sentences. Cutler and Butterfield suggest that because function words and functional morphemes tend to be unstressed, listeners have a tendency to perceive strongly-stressed syllables as indicating the beginning of a content word, so that listeners are likely to insert a word boundary before a stressed syllable and to delete them before weak syllables. Listeners assume that if boundaries are inserted before weak syllables, they indicate function words. However, this is not a fool proof way of segmenting words, and there may still be issues with lexical segmentation for L1 listeners. In English, for example, Harley (2008:259) explains that the cognitive tendency for the L1 speaker and the L1 listener is to segment speech so that it does not leave parts of syllables unattached; consequently, word boundaries may be perceived erroneously, particularly

²² Constraints on allowable sound combinations in a language are generally referred to as phonotactics (Radford et al, 2009).

when words are unexpected or less audible. In Cutler & Butterfield's (1992) experiment, an unexpected utterance *conduct ascents uphill* was spoken quietly so that it was less audible; and since it was both unexpected and less audible, it proved difficult for L1 listeners to segment. One person perceived and segmented the utterance as the *doctor sends the bill*, another as a *duck descends some pill*.

Although L2 listeners may be able to use the same cues as L1 listeners to some extent, they may not do so quite as successfully (Weber & Broersma, 2012). Akker & Cutler (2003) found that although Dutch L2 listeners of English were able to process prosodic information, they were slower than L1 listeners and there was a difference between responses in both prosodically accented or unaccented sentences, leading Akker & Cutler to suggest that L2 listeners have less automaticity in relating prosodic to semantic information (see also Andringa et al., 2012.) Chenu and Jisa (2009) also point out that the ability to use the syllable stress of the L2 to segment words is not automatic; moreover, L2 listeners' automatic processing mechanisms from their L1s may actually interfere with lexical segmentation processes in the L2. There is some evidence that when listening to an L2, listeners have been found to use the segmentation strategy they know from their L1, including syllable stress and timing (Weber & Broersma, 2012). An example of this can be seen in the study of L1 French speakers listening to L2 English which was conducted by Cutler, Mehler, Norris and Segui (1986), who found that the French listeners' segmentation strategies were based on syllable-stress (as in French) rather than on time-stress (as in English).

1.5.ii. *Recognition of function words*

The main focus of L2 word recognition has been on the recognition of content words. However, the focus of this thesis is on the ability of L2 listeners to English to recognise function words along with functional morphemes, both of which are prone to modifications and elisions through co-articulation and due to weak syllable stresses.

Where there has been research on this, researchers tend to agree that hearing function words and function morphemes when listening to English can be problematic for L2 listeners, even for listeners with higher levels of proficiency (amongst others: Andringa et al, 2012; Clahsen & Felser, 2006a & 2006b; DeKeyser, 1997 & 2005, Ellis 2006; Field, 2001, 2003 & 2008; Gor, 2010 & 2015; Han, 2003; Jiang, 2004; Trenkic, Mirkovic & Altmann, 2014).

Recognising functors is useful for accurate sentence comprehension since English grammar depends both on word order and on the use of functors. Processing sentences consists of at least three cognitive phases: recognising words, parsing, and semantic integration (e.g. Jiang, 2018). Word recognition activates not only meanings, but also the syntactic properties of the words – e.g. what type of word it is and what its morphological structure is, along with lexical associations. In respect of parsing, it has been suggested that cognitive mechanisms (referred to as ‘the parser’) parse the sentence into syntactic segments; that is, the syntactic form of the surface structure of the sentence (word order, function words and function morphemes) are processed into phrases and clauses so the listener can clearly understand ‘who did what’ (Blank, Balewski, Mahowald & Fedorenko, 2016). This allows the listener to construct a surface form syntactic representation as they listen (Roussel et al., 2017), from which the underlying conceptual meaning that the sentence represents can be comprehended through the activation of conceptual semantic representations (Szmalec, Brysbaert & Duyck, 2013).

This thesis suggests that accurate sentence comprehension suffers if listeners do not recognise inflections, auxiliary verbs and modal verbs that express tense, aspect and modality. In fact, the understanding of ‘who did what’ is compromised if the listener is not sure of either the ‘when’ or the ‘if’ – that is: whether the event has taken place or is yet to take place; whether the event should be viewed as a cause, a consequence or a co-occurrence of another event; or whether the event is only ‘irrealis’ in the mind of the speaker.

1.6 Review: listening to English as a second language – debates around processing functional words and functional morphemes in spoken language

There are several ongoing debates that are of interest to the question of how people process words and morphemes when listening to connected speech. These relate to whether words are processed as whole words or as stems plus bound morphemes, the interplay between declarative versus procedural processing, and the extent to which L2 listeners are able to process sentences similarly to L1 listeners. These debates are summarised below.

1.6.i. Whole word processing or decomposition

At the processing level of speech perception (and production), an interesting debate, which continues to date, is whether lexemes in all their forms are stored in, and retrieved from, the mental lexicon as whole units, or whether the root of the lexeme is stored separately from its bound morphemes (e.g. Fernandez & Smith Cairns, 2011:194).

Literature in morphology raises questions as to whether the internal structure of an inflected word should be decomposed into a stem plus inflected morphemes for analysis purposes, or whether it should be treated as a representation of a word stem with a set of features – for instance, in the case of verbs, with features that denote tense, aspect and agreement (Marantz, 2013: 908). This pertains to whether there is a word-internal syntax or merely a word-external syntax. In the case of derivational morphemes, this debate would extend to whether derivational morphemes exist as separate entities, or whether the suffix is simply an allomorphic feature which is realised phonologically (Marantz, 2013).

In the case where both word-internal and word-external decomposition is deemed to exist, Marantz suggests that a bound morpheme could be considered to combine with a verb stem, syntactically, in more or less the same way as a function word is associated with a content word, for example as a determiner combines with a noun. In this case, according to Marantz, functional morphemes should be placed in the same category as function words. However, where decomposition is deemed not to exist, function words and bound functional morphemes should be viewed as different. In line with this debate, is the question of how clitics may be viewed. S. R. Anderson (2008:4) has suggested that when auxiliary verb clitics attach leftwards onto the preceding word, they may be viewed as new lexemes, with the reduced auxiliary verb being analogous to regular inflectional morpheme affixes, such as the plural *-s* or past tense *-ed*. Such debates are of interest as they raise the question as to how to view function words, such as auxiliary verbs and modal verbs, that are usually reduced phonologically in spoken language to resemble bound morphemes, and are consequently also reduced in written language. Moreover, such debates contribute to the psycholinguistic questions of how exactly human cognitive mechanisms parse the stream of sounds that are produced in speech.

The psycholinguistic debate on whether words are processed as whole words or undergo decomposition includes three different sets of views (Jiang, 2018). The first set of views, first proposed by Taft and Forster (1975), is that complex words are decomposed – that is the stem is stripped of its affixes – and word recognition occurs initially through the stem of the word. Morphological decomposition is obligatory, precedes lexical access, and follows some sort of decomposition rules. The second set of views, which are usually attributed to Butterworth (1983), propose that all complex words are represented, and retrieved from, the mental lexicon in their full forms. Different forms of a word have different lexical entries but are connected through morphological or semantic links (e.g. Jiang, 2018). The third set of views is known as the dual-route model (or dual-route hypothesis). This model accepts that processing occurs both through morpheme decomposition and through direct mapping of whole words. It suggests, for instance, that

inflected regular verbs are decomposed but irregular verbs are processed as whole words (e.g. Pinker, 1991; Pinker & Ullman, 2002). Pinker & Ullman (2002) further suggest that when regular verbs have a high frequency, they are likely to undergo whole word processing in their inflected state rather than decomposition

1.6.ii. *Declarative and procedural memory*

Research in psycholinguistics has suggested that processes of sentence comprehension are underpinned by two types of memory. Declarative memory which is believed to underlie knowledge of facts and events, the mental lexicon, and lexical-semantic processing; and procedural memory which is believed to subserve non-linguistic motor and cognitive skills, sequences, and processing of syntax (Gor; 2015; Newman, Ullman, Pancheva, Waligura & Neville, 2007; Pinker, 1991 & 1999; Ullman, 2001 & 2004). In line with the dual-route hypothesis, recent research has suggested that functional morphemes may be subserved by both declarative and procedural memory. That is, derivational morphemes and irregular forms of inflectional morphemes may be stored in, and retrieved from, the mental lexicon as whole word representations, underpinned by declarative memory; whereas lexemes with regular inflections may be decomposed during parsing, with the inflected morphemes being processed through a rule-governed mechanism underpinned by procedural memory (Newman et al, 2007:435-436). This dual-system theory draws on findings from earlier research studies by Clahsen (1999), Pinker (1991 & 1999) and Schreuder & Baayen (1995), and has been supported by recent research by Bakker, MacGregor, Pullvermüller & Shtyrov (2013), Leminen, Leminen, Lehtonen, Nevalainen, Ylinen, Kimppa, Sannemann, Makela & Kujala (2011), Leminen, Lehtonen, Leminen, Nevalainen, Makela, & Kujala (2013a), Leminen, Leminen, Kujala & Shtyrov (2013b) and Pullvermüller, Cook & Hauk (2012). Leminen et al. (2013b) further found evidence that although derivational morphemes are more likely to be processed as unitary representations and inflectional morphemes more likely to be processed through

a combinatorial route, both mechanisms are activated rapidly and largely automatically in the L1.

It should be noted, that although this thesis refers to the ‘mental lexicon’ throughout, there are different views on what this is. De Sousa and Gabriel (2015) explain we still do not know exactly what such a lexicon is, how it is structured, or what information it contains. Some researchers believe there is one lexicon where all information levels are integrated; other researchers believe there could be several lexicons, one for each level of information (e.g. phonological, morpho-syntactic, semantic, etc); it has further been suggested that bilinguals have a separate mental lexicon for each language; and some researchers, such as Elman (2004) have even suggested that there is no lexicon at all. De Sousa and Gabriel (2015) suggest it might be useful to think of the lexicon as an interface structure rather than a storage structure, which “does not store all linguistic and non-linguistic information, but integrates information widely distributed in the brain and patterns of activation make some [network] routes easier than others due to different variables, among them frequency of use, for example” (de Sousa & Gabriel, 2015: 356). However, since some models and some theories refer to the mental lexicon as though it exists and is akin to some kind of mental store of words, similar to a dictionary, this thesis uses the term similarly.

1.6.iii. *Do L2 listeners process sentences similarly to L1 listeners?*

When we listen to speech, the form of the sentence (sentence surface structure) is decoded to allow an understanding of the communicated message: as we perceive articulated speech, the speech sounds are mapped onto phonological representations held in the brain so that words, or parts of words, are recognised; we parse the sentences to understand the significance of the word order, the function words, and the functional morphemes; and we use our prior knowledge to understand the concepts that the

message is conveying. There are two types of information that help a listener to construct a surface form syntactic representation as they listen – that is, to reconstruct the form of the sentence that they are listening to (Jiang, 2018). The first is morpho-syntactic information – that is, word order and morpho-syntactic markers (the latter being function words and functional morphemes) – and this information works together with the individual's morpho-syntactic knowledge to develop the syntactic representation. The second type of information is lexico-semantic information, which works together with semantic plausibility (Jiang, 2018).

In respect of L1 listeners, Mattys and Wiget (2011) point out that in optimal listening conditions, it would appear that L1 listeners do not conduct a thorough syntactic analysis of sentences but rather rely more strongly on lexical-semantic knowledge than on sub-lexical syntactic cues for sentence comprehension. This tallies with findings from other researchers, such as Oakhill, Garnham and Vonk (1989), who draw on previous work by Johnson-Laird (1980 & 1983) and Garnham (1981, 1982a, 1982b, 1987), to differentiate between surface-level representations and 'mental model' representations of sentences. They claim that mental models may be created in the L1 without the need for a full surface-level grammatical analysis of the sentence. Later research undertaken by Ferreira, Ferraro & Bailey (2002) and Ferreira (2003) has shown that L1 listeners may fail to interpret accurately even simple and common sentences but instead opt for shallow forms of processing that are 'good enough' through the use of heuristics, rather than through the use of a detailed linguistic representation. Ferreira et al. claim that evidence of incorrect interpretations of sentences made by L1 listeners indicates that language, as other forms of stimuli, can be processed to different depths.

Nevertheless, as Oakhill et al. (1989) point out, although an L1 listener may not always need to fully analyse the surface level structure of a sentence in order to create a mental model of the message it represents, the L1 listener **is** able to conduct a full analysis and may do so when sentences are indeterminate or require more consideration. They

suggest that when sentences are determinate and the mental model is created rapidly, the exact surface form of the sentence is lost within a few seconds; however, when sentences cannot be processed in such a straightforward way, the exact form of the sentence may be held a little longer and retrieved for further processing to take place.

In the context of L2 listening, there is general agreement that L2 listeners do not process the incoming speech signal in the same way as L1 listeners, and that L2 listeners rely even less than L1 listeners on detailed syntactic analyses. L2 listeners are thought not to process spoken languages as rapidly as L1 listeners and, to compensate, L2 listeners rely much more on lexical-semantic cues for interpretation and less on syntactic information (amongst others: Andringa et al, 2012; Clahsen & Felser, 2006a; Field, 2001; Gor, 2010; Roussel et al, 2017).

Interestingly, it would seem that the more skilled the L2 speakers become in listening in the target language, the more they have a tendency to engage in compensatory higher-level top-down cognitive processing strategies (Field, 2001). Even L2 listeners with an advanced level of language proficiency seem to utilise lexical, semantic and pragmatic knowledge in preference to conducting detailed syntactic analyses when processing speech (Clahsen & Felser, 2006b; 2006c), a hypothesis that Clahsen & Felser (2006b) refer to as their 'shallow structure' hypothesis. One reason given by Clahsen & Felser for this phenomenon is the possibility of L2 listeners having an incomplete grammar. They state, "As successful parsing relies on the availability of the relevant grammatical knowledge, nontargetlike properties of a learner's interlanguage grammar may give rise to nonnativelike processing behaviour" (2006b, p14).

In general, two main reasons for L2 listeners' limitations in processing have been proposed: either that learners (late learners in particular) do not have access to certain aspects of universal grammar that were available to them when they learnt their L1 and are therefore unable to develop competence in the new grammar fully (representational

deficit), or that lack of accuracy is caused by difficulties individuals have in mapping abstract grammar to surface forms of morphemes (processing deficit) (Jiang, 2004; Morgan-Short, Sanz, Steinhauer & Ullman, 2010; Trenkic, 2007). The former view proposes that an individual cannot achieve accuracy of syntactic processing in the L2 that would be comparable to that of an L1 listener, whereas the latter suggests that this is possible but takes time to develop.

Further research on processing differences between L2 and L1 listeners has investigated whether differences may be linked to differences in the use of declarative versus procedural memory. Given L2 listeners' over-reliance on lexical-semantic aspects of speech, suggestions are that morphological decomposition occurs to a lesser extent in L2 processing because L2 listeners rely more on declarative memory than on procedural memory (Gor, 2015, Jiang, 2018; Ullman, 2005). Ullman (2005), in particular, found that L2 learners rely more on declarative memory in relation to multi-morpheme words, as they have a tendency to process inflected words as whole words (in particular in respect of inflected past tenses) in contrast with L1 speakers for whom verbs with inflected past tenses would be decomposed through procedural memory.

More research needs to be conducted into how L2 listeners process the incoming speech signal, but what has been clearly established is that L2 listeners to English do not recognise function words and function morphemes to the extent that L1 listeners do, and this holds true even for listeners with higher levels of proficiency (e.g. Andringa et al, 2012; Clahsen & Felser, 2006a & 2006b; DeKeyser, 2005, Ellis 2006; Field, 2001, 2003 & 2008); Gor, 2010 & 2015; Han, 2003; Trenkic, Mirkovic & Altmann 2014).

1.7 Review: the explicit versus implicit language learning debate

1.7.i. *Are second languages learnt implicitly?*

The debate in second language acquisition studies on whether learners can learn a second language through explicit instruction or whether they can only acquire it implicitly was greatly influenced in the 1980s and 1990s by Stephen Krashen (1981 & 1993). Krashen claimed that learners are only marginally influenced by explicit grammar teaching; what is taught explicitly cannot become part of a learner's subconscious competence but can only remain in their conscious knowledge to be used as a language filter, or monitor. It is only implicit acquisition that can lead to automaticity of language. Effective learning, according to Krashen (1981) comes only from 'comprehensible input', that is, sentences whose meaning a learner can understand despite not knowing all the vocabulary or all the grammar forms. His belief was that L2 learners can **only** acquire new language structures and vocabulary implicitly from 'comprehensible input'. It was such claims that influenced the move toward the communicative approach in English language teaching; furthermore, they were supported by Paradis's (2004) claims that explicit and implicit knowledge are neurologically distinct (see Larsen-Freeman, 2015). However, there are a number of researchers who have claimed that explicit attention to grammatical form does lead to language development and to spontaneous production and is useful in building a learner's competence (e.g. Spada & Tomita, 2010; Scheffler, 2012).

This implicit-explicit language acquisition debate has continued in psycholinguistic literature. Morgan-Short, Steinhauer, Sanz and Ullman (2012), reviewing the literature on Event Related Potential (ERP) studies²³ in relation to morpheme violation investigations, report findings that the neural processes underlying L2 lexical-semantic processing are

²³ ERP studies show there is negative voltage change approximately 400ms after a semantically odd word (N400) or a positive voltage change approximately 600ms after a syntactically odd word with syntactic violations (P600) (e.g. Leminen, et al. 2011).

similar for L2 listeners and L1 listeners, across high and lower levels of L2 language proficiency; however, there are differences between L2 and L1 listeners in respect of processing morpho-syntax. Furthermore, there are also differences among L2 listeners in respect of processing morpho-syntax, depending on the level of L2 proficiency. According to Morgan-Short et al., the ERP studies they reviewed provide some evidence that L1-like brain processing can be achieved by L2 listeners in respect of morpho-syntax, when they reach higher levels of proficiency. What is unknown, is the type and amount of exposure needed for L2 listeners to reach an L1-like level of processing.

In order to investigate the impact of different methods of exposure to the target language, Morgan-Short et al. set up a study in which they taught participants a new language. Practice sessions in the new language involved participants both listening to, and orally producing, meaningful sentences that were task focused. Prior to each set of practice sessions, learners received either explicit training or implicit training. Explicit training involved explanations of language rules and the provision of metalinguistic information, followed by meaningful practice sentences; implicit training exposed participants only to meaningful phrases and sentences prior to practice sessions but offered little or no metalinguistic information. Participants were trained in an artificial language, Brocanto2 (this was based on a previously established artificial language Brocanto, but adapted by Morgan-short et al. for their study). In post-tests, both the lower and the higher groups of L2 participants showed neural processes similar to the neural processes exhibited by L1 listeners in other studies in respect of lexical-semantic processing; however, only the implicit training condition elicited neurological ERP components typically found for L1 morpho-syntactic processing, and only in the case of the higher-level rather than the lower-level participants. Therefore, in respect of differences between implicit and explicit training, Morgan-Short et al. suggest that their study “indicates that implicit training may be better than explicit training at realizing gains toward the attainment of high proficiency” (Morgan-Short et al., 2012:942).

Morgan-Short et al.'s findings are of interest to this thesis and raise some interesting points in relation to our investigation. Firstly, their experiment was conducted under very controlled conditions using an artificial language, and caution must be displayed in likening their experiment to learning a real language. Nevertheless, it does suggest that language learners' processing mechanisms can undergo changes as their language proficiency develops, particularly in respect of morpho-syntactic processing. Secondly, their experiment suggests that, at least for some morpho-syntactic elements, L2 listeners can achieve L1-like brain processing. Thirdly, it suggests that implicit training is useful. However, it should be noted that the implicitly trained group received considerably more practice sentences than the explicitly trained group during the training session. As Morgan-Short wanted to keep each training session equal in terms of time in each training session, the implicit group received 33 plus 94 meaningful example sentences, whereas the explicitly trained group received only 33 example sentences plus explanations; thus the implicitly trained group received much more exposure to language structures during training. Fourthly, the experiment adds an additional dimension to the explicit-implicit language learning debate.

A different perspective on how learners acquire language has been presented by R Schmidt (1990 & 2010). In his Noticing Hypothesis, Schmidt claims that the input the learner hears does not become intake unless it is noticed – that is consciously registered. He claims that second language learners need to notice, and be aware of, the form of the target language in order to acquire it. The target language cannot simply be implicitly absorbed from the input without receiving attention, even if the input is comprehensible and heard frequently. Schmidt (1990) bases his claims on the fact that many language learners become 'fossilized' in their language learning, despite living in the target language country for many years and working professionally in the L2. Schmidt's claims are that L2 speakers' language becomes fossilized when they stop noticing, or fail to notice, elements of the form of language, and he suggests that learners are more likely to

notice input if it is repeated, if it is perceptually salient in some way, and if learners' attention is directed to it.

The term 'fossilization' was coined by Selinker (1972) to describe the state wherein there is a non-progression of L2 learning, despite continuing exposure to the L2 (Han, 2003). Segalowitz (2003:387) defines fossilization as " 'fluent', robust habits of incorrect speech". Thus, a person's L2 is deemed to have fossilized when their accuracy levels plateau – that is, when learners have become fluent and effective communicators but continue to make the same language errors. Han (2003) points out that even if language learners' attention is drawn to their errors and they have a great deal of exposure to 'correct' forms of the language, they continue to make the same errors repeatedly in a state of fossilization.

An alternative proposal put forward by the ELT specialist, James Nord (1980, 1998) in respect of fossilization, is that premature speaking in an L2, before grammatical accuracy has been learnt, can lead to fossilization, because "Whatever we say is also what we hear, and what we hear we say, and speaking errors provides us with error-filled listening. When repeated enough, our error-filled speech 'sounds right' " (Nord, 1998: online-page not given). Nord likens language to a closed-loop system that "controls its own behaviour on the basis of previously learned models" (online page not given). He points out, that people who are fluent communicators may develop a large vocabulary but have a control of grammar that is at a much lower level, suggesting that weaknesses in grammar could be due to L2 learners acquiring fossilized incorrect patterns of language due to repeatedly hearing incorrect speech. In his theory, listening must 'create a map' in memory of language structures and vocabulary, and what is listened to, including the grammatical forms and structures, must be both comprehensible and noticed; otherwise, the 'language map' is incomplete and incorrect

Despite the influence of Krashen's claims and the predominance of the communicative approach in the language classroom, teachers do still generally engage in a certain

amount of explicit grammar teaching, and there is some evidence that this has an impact (Larsen-Freeman, 2015). However, according to Larsen-Freeman, explicit grammar teaching is often not integrated into other aspects of language learning but tends to be taught as stand-alone activities; moreover, when attention is turned to the form of language that learners produce when communicating, the attention is often reactive – that is, directing learners’ attention to the language form once they have produced an error. Thus, some explicit attention to language form does take place in the ELT classroom in addition to the communicative activities. Notwithstanding, there is a question as to how much exposure learners have in the classroom to either explicit instruction about, or implicit noticing of, morpho-syntactic structures. In addition, we raise the question as to how much of this exposure actually takes place through **listening** practice and, when it does, how much attention is actually given to noticing and understanding the sentence form. As the review on language teaching in section 1.2 above suggests, it is likely that this is fairly limited when listeners have reached an intermediate stage of proficiency and higher.

A key question underpinning the debate then is how L2 learners acquire ‘automaticity’ in the target language, both for speech production and for speech processing. Can they acquire it through explicit instruction or only through implicit exposure? Segalowitz (2003) has framed the issue somewhat differently by drawing similarities between language acquisition and the acquisition on any kind of skill. Referring to J. Anderson’s ACT²⁴ theory (see J. R. Anderson & Lebiere, 1998), Segalowitz explains that skill acquisition requires a transition from declarative knowledge (where rules are explicitly taught or known) to procedural knowledge (where rules are applied automatically) through the process termed ‘proceduralization’, with the end result of automaticity. Automaticity in L2 performance, in Segalowitz’s terms, is when there is a restructuring of cognitive mechanisms so that L2 processing moves from a non-automatic state to an automatic state. In Segalowitz’s definition of the automatic state, processing features

²⁴ Adaptive Control of Thought.

include: 'ballistic' processing – that is processing that is unstoppable once it is activated; processing that takes place automatically irrespective of a load of additional information; effortless processing that requires limited attentional resources; and automaticity in recognition memory where recognition is an unconscious process (Segalowitz, 2003: 387-388). This approach appears to fit with the idea that grammar should be taught explicitly first, and then allowed to become automatic later through practice. It should be noted that, in line with skill theory, each of the four language skills of speaking, listening, reading and writing should be treated as separate skills, entailing that listening should be practised in its own right. As such, listening would need to be 'taught explicitly' before it can develop implicitly through exposure. In this respect, it would be beneficial to teach all aspects of listening, including 'listening for grammar'.

1.7.ii. *Current psycholinguistic perspectives on second language acquisition*

While there is tradition of following a Chomskian universal grammar language-specific line in L1 and early L2 language learning, a recent trend in psycholinguist research has been to focus on language learning as essentially happening through domain-general mechanisms (Saville-Troike & Barto, 2017). Theories following a domain-general approach, tend to focus on information processing, connectionism, or the emergence of language.

The assumption in information processing theories is that second language acquisition is similar to the acquisition of any complex cognitive skill (McLaughlin, 1987). Information processing theories are therefore concerned with the mental processes involved in language learning and use, and include: perception; the input and intake of new information and how mental representations are formed, organised, changed, and regulated; how information is retrieved; and what processes there are for output (Saville-Troike & Barto, 2017). Assumptions underlying information processing are that: learning a complex skill initially involves controlled processing, which demands learner's attention; learners move from controlled to automatic processing with practice, and this involves a

restructuring of mental representations resulting in more automatic processing; automatic processing requires little attentional effort because structures are more integrated and efficient; increasing proficiency in second language acquisition comes from restructuring of internal L2 mental representations along with larger stores in memory (McLaughlin, 1987; see also Saville-Troike & Barto, 2017).

A prominent model of how first and second languages are learnt is that of Bates and MacWhinney's (1981) competition model (see also MacWhinney, 1987). This model claims that form-function mapping is basic for L1 acquisition, and that all linguistic performance involves mapping the physical properties of the form with what the form means semantically or does grammatically. For second language acquisition, the claim is that the learner's internalized L1 system of mapping needs to be adjusted to the L2, by noticing the association between cues (elements) in the language input and their function in the sentence. The important thing in this model is that language elements are viewed as cues of functions, rather than as following discrete, non-variable grammatical rules (MacWhinney, 1987). Cues are seen as having two levels – the functional level in which the meanings and communicative intentions to be expressed in an utterance are represented, and the formal level in which the corresponding surface forms are represented (MacWhinney, 1987: 318). Cues must be understood not just in terms of their function, but also in terms of their position in relation to other cues and to how reliably they are encountered as fulfilling the same communicative function. What is fundamental to the competition model is that forms compete and functions compete during both sentence comprehension and sentence production, but the more valid the cue and the stronger the form-function association, the less likely that a competitor will be accepted. Perhaps a comparison may be drawn here between the concept of cues in the Competition model with Ferdinand de Saussure's (1915 – but see 1974) concept of signs: as cues have their two levels of physical form and related communicative function, signs also have their dyad of signifiers along with the related meaning of the signifiers – that is the signified.

Rohde and Plaut (2003) present connectionist models as moving away from more traditional approaches to language processing, claiming that traditional approaches are based on explicit, discrete representations which, they claim are difficult to learn from a reasonable linguistic environment. Instead, the connectionist perspective views language performance “not as an imperfect reflection of some abstract competence, but rather the behavioural manifestation of the internal representations and processes of actual language users” (2003:10). Moreover, they emphasise that the attraction of connectionist approaches is their theoretical underpinning that the same processing mechanisms apply across all linguistic structures; language learning is therefore believed to take place in the same way as all other general learning and is domain general. Connectionist approaches therefore tend to focus on the increasing strength between stimuli and responses rather than on abstract grammar rules or on cognitive restructuring (Saville-Troike & Barto, 2017). From a connectionist perspective, learning is about the strengthening of connections between stimuli and responses, where processing takes place in a spreading activation network of units that are connected by pathways (e.g. McClelland, Rumelhart & Hinton, 1986). Connectionist approaches suggest that children can learn a language because they can generalise from the input they have been exposed to, through the use of analogy; thus language ‘emerges’ through children’s ability to generalise, recognise patterns, and draw analogies (de Bot, Lowie & Verspoor, 2005). As such, language is believed to emerge from the dynamics of language use (e.g. Bybee, 1985 & 2006; Ellis, 2002; Langacker, 1987; Tomasello, 1998 & 2003). This has been explicitly outlined in the usage-based account of language learning, which is underpinned by connectionist theories.

1.7.iii. *The usage-based language learning theory*

The usage-based theory of first language acquisition has its origins particularly in the work of Langacker (1987 & 2008), and Bybee (1985 & 2006), and was developed as a coherent

theory of first language acquisition in children by Tomasello (2003 & 2009). Ellis (2002; 2006a & 2006b) extended usage-based theory to second language acquisition and, in the last decade, the theory has gained some ground among second language acquisition researchers, for instance Larsen-Freeman (Ellis & Larsen-Freeman, 2009) and Zhang and Mai (2018).

Usage-based language acquisition claims that language is developed through repeated exposure to linguistic structures and constructions, whether these structures are morphemes, lexemes, word classes, syntactic structures or idioms. Langacker claims that, as individuals are exposed to repeated use of a linguistic structure, the structure becomes increasingly more strongly entrenched in the mind, stating that, “Every use of a structure has a positive impact on its degree of entrenchment” (1987:57). He suggests, firstly that repetition and rehearsal increase the strength of representations of linguistic structures; secondly that when linguistic structures are repeatedly used, they come to be processed as holistic units; thirdly, that when structures are not used, they are at risk of decay. Langacker (2008) suggests that the two facets, namely the repetition/rehearsal facet of entrenchment and the facet of processing holistic units (chunks) rather than the constituent components, can together lead to a reduction in conscious monitoring of linguistic structures (see also H.J. Schmid, 2014). H.J. Schmid (2014), points out that the two facets of entrenchment postulated by Langacker are cognitive facets. The former, he proposes, leads to memory consolidation, while the latter reduces the need for analytical processing of the constituent components of the structure. Thus, in Schmid’s view, entrenchment in its simplest definition can be understood as referring to the cognitive processes of memory consolidation, chunking, and automatization (2014:3). The main determinant of entrenchment, as identified by Langacker (1987) and by Bybee (1985), is frequency of exposure to and use of linguistic structures (Schmid, 2014:3). There is agreement that frequency affects all levels of language learning: phonological, phonotactic, lexical, morphological, syntactic, sentence production and sentence

processing (Ambridge, Kidd, Rowland & Theakston, 2015; Bybee, 1985 & 2006; Ellis, 2002; Langacker, 1987 & 2008; Schmid, 2014; Tomasello, 2003 & 2009).

Tomasello's proposal on L1 language acquisition in children stated that the usage-based approach was based on communication in use, explaining that 'meaning is use' and 'structure emerges from use' – by this, he was emphasising that meaning-based grammatical constructions emerge from individual acts of language use (Tomasello, 2009:69). He proposed that children use their general cognitive skills for learning languages; in particular, he identified two sets of general cognitive abilities used for more general functions, that are important in language acquisition, namely intention-reading and pattern-finding. Tomasello explains these two sets of cognitive skills in the following way: intention-reading is what children do "to discern the goals or intentions of mature speakers when they [the mature speakers] use linguistic conventions to achieve social ends, and thereby learn these conventions from them culturally" (2009:69-70); pattern-finding is what children do "to go productively beyond the individual utterances they hear people using around them to create abstract linguistic schemas or constructions" (2009: 70). Tomasello uses the term 'pattern-finding' to include the cognitive functions of categorization, analogy and distributional analysis, and claims it is "the central cognitive construct in the so-called usage-based approach to the acquisition of grammar" (page 70). In other words, children learn what mature speakers intend them to understand from an utterance – that is the communicative message. From this, they learn the words and patterns of words that the mature speakers use to express the communicative message.

In respect of learning new words, Tomasello (2009) claims that children try to comprehend a speaker's communicative intentions, and in this way they often understand a word through the functional role it has in the utterance – as they hear more utterances that include the particular word, they learn to see commonalities of the functional role of the word across the utterances. According to Tomasello, this does not only apply to content words (such as nouns and verbs) but also to function words whose function, in

the main, can only be learnt in this way. In particular in relation to function words, he points out that a process of mapping of words onto things cannot be involved.

In respect of learning grammar and acquiring grammatical competence, Tomasello refutes the possibility that children learn individual words in isolation and then put the words together through abstract *meaningless* rules of grammar (see Tomasello, 2009:75). Instead, he claims that children hear the linguistic constructions and find analogical patterns across utterances with the same constructions and the same type of communicative functions. In his terms, a linguistic construction is “a unit of language that comprises multiple linguistic elements used together for a relatively coherent communication function, with sub-functions being performed by the elements as well” (2009:75) – although constructions may vary in numbers of elements and levels of complexity, and may be as simple as a ‘noun + plural ‘s’ ending’, or may be more complex, such as ‘NP was verb+ed by NP’ (page 75). In this way, Tomasello suggests that children learn grammar patterns through understanding **how** these patterns of language are used and **what** they are used for, and thus build up schemas of the various patterns. Through the use of schemas, children can create novel sentences by using the patterns they have abstracted from previous experiences, while filling some of the slots in the construction with different words from a paradigm of suitable words. As such, once the patterns (or schemas) are established (or entrenched) in the mind, a child is able to create new utterances that they have not previously heard but which are meaningful sentences. Tomasello’s claim is that a child can create novel sentences through abstracting linguistic constructions as schematic frames for use across different situations when the child understands the communicative use of those constructions.

Schmid explains that the association between the types of linguistic elements that can go in particular slots within constructions leads to categorization, abstraction, generalization and the emergence of schemas, as the mind recognises similarities between strings of morphemes and words, categorises them, draws analogies between the role the

construction plays, and forms schemas of the linguistic constructions (2014:5). As Behrens (2009:386-7) says, a schema unites experiences from an overarching perspective, and schemas can, themselves, be integrated to form larger units by means of composition. Such composite structures allow new qualities to emerge, allowing new and more complex structures to emerge from combining simpler elements, tokens and types, with language structures emerging from the processes of listening to, and producing, speech (MacWhinney, 1999:ix-xi). In this way, children are enabled to construct a system of grammar using domain-general skills, with the structural properties of language emerging from serial order and procedural memory (Behrens, 2009; Gupta & Dell, 1999), symbol recognition, category formation, intersubjective communication, and the ability to process vocal-auditory information rapidly (Tomasello, 1998).

A key characteristic of usage-based theories is that language learning depends on repeated exposure to linguistic structures and constructions – that is a frequency effect. Although Ellis (2006a) also highlights the importance of frequency for language acquisition, he extends his model to include contingency between the cued element and the association with the interpretation of the cue. That is, the developing associations between cues and their functional outcomes can be understood as contingency learning. He claims contingency of cue associations is an essential part of both L1 and L2 acquisition. In respect of contingency, Ellis highlights the importance of **reliability** in the mapping between the form of the element or construction (the cue) and its function. This reliability is associated with probabilistic values and predictive values (that is - what are the likely meanings of what I am hearing and what words and constructions am I likely to hear next?). He explains,

“Not only do we know the constructions that are most likely to be of overall relevance (i.e. first-order probabilities of occurrence), but we also predict the ones that are going to pertain in any particular context (sequential dependencies), and the particular interpretations of cues that are most likely to be correct (contingency statistics). These predictions are usually rational and normative in that they accurately represent the statistical covariation between events. In these

ways, language learners are intuitive statisticians; they acquire knowledge of the contingency relationships of one-way dependencies and they combine information from multiple cues” (2006a:7).

Ellis (2006a & 2006b) fundamentally proposes that L2 language acquisition can work in the same way as L1 acquisition, but it often does not because it is not always as ‘rational’. According to Ellis (2006a), when “input may fail to become intake” (2006b:164), this can largely be attributed to the factors of contingency, cue competition, salience, overshadowing or blocking, interference from the L1, and the perceptual learning which is shaped by the L1 and thus does not distinguish sensory forms in sufficient detail in the L2. Cues in the L2 may be ignored because the form-meaning contingencies, acquired from input and usage in the L1, have ‘tuned’ the ways in which an individual selectively attends to cues when processing language utterances. Ellis (2006a) has proposed that learners tend only to focus on one cue at a time and therefore cues of low importance or low salience do not compete for focus because the cue of low importance or salience is ‘off the radar’. He suggests that cues may be of low importance, firstly because the target cue is an alien element in the L1 – that is, there is no direct mapping, secondly because its meaning is largely redundant - that is, the meaning can be inferred from other elements, or thirdly because its outcome in some way is given low importance. By low salience, Ellis means that the listener does not psychologically notice the cue. This contrasts with the more usual use of the term salience, which tends to refer to perceptual salience, where a cue is perceptually noticeable due to heightened syllable stress, volume, pre-cue pauses, and so on. Ellis states that, “salience refers to the intensity of the subjective experience of stimuli, not of the objective stimuli themselves. Salience, as subjective experience, varies between individuals” (2006a:16). In this way, lack of salience allows more salient cues to overshadow, or block, the selective attention paid to the less salient target ones.

It is common understanding in the fields of phonetics, bilingualism, L2 acquisition and language teaching that an individual’s perceptions of speech cues in the L2 are influenced by the individual’s perceptual system which has been shaped by their L1. It is also

commonly accepted that words from a person's L1 can interfere with L2 word recognition. However, of particular interest to this thesis, is Ellis's inclusion of contingency and salience in addition to frequency in relation to L2 acquisition (Ellis, 2002 & 2006a; and see also Larsen-Freeman, 2010). According to Ellis (2006a), it is issues with contingency and salience along with low outcome importance that can account for L2 learners' difficulties with learning grammatical functors, and not issues with frequency - since functors are so frequent in the input, that their acquisition should be guaranteed if it was based on frequency and context alone.

In respect of the discussion on explicit versus implicit learning, Ellis (2002:145) says:

"To the extent that language processing is based on frequency and probabilistic knowledge, language learning is implicit learning. This does NOT deny the importance of noticing (Schmidt, 1990) in the initial registration of a pattern-recognition unit. NOR does it deny a role for explicit instruction. Language acquisition can be speeded by explicit instruction. The last 20 years of empirical investigations into the effectiveness of L2 instruction demonstrate that focused L2 instruction results in large target-oriented gains, that explicit types of instruction are more effective than implicit types, and that the effectiveness of L2 instruction is durable."

Thus it would appear that Ellis advocates explicit instruction while stating that language learning is inherently implicit.

In relation to learning grammatical functors, both Dekeyser (2005) and Ellis (2006b) have highlighted the fact that these are particularly difficult for L2 learners to perceive as they are usually reduced in spoken language and therefore less salient. Moreover, DeKeyser (2005) and VanPatten (1990) point out that another reason why L2 listeners may not notice functional morphemes is due to their partial redundancy in language. Both DeKeyser and VanPatten make the distinction that some functors are essential for meaning as they are the only clue to a certain meaning, but others are redundant because their meaning is primarily represented elsewhere in the speech context. In respect of

learning grammatical functors, the Five Graces group (2009), talking about emergent language and usage-based approaches to language acquisition, in fact state that without explicit instruction directing L2 learners' attention to the functors in the input, the language of a high proportion of adult language learners would be simplified, with a resultant irregularity in comprehension and production and a loss of redundancy (2009:11).

Finally, VanPatten (1990) points out that it may be difficult for L2 listeners to pay attention to both the meaning of a sentence and to particular language forms at the same time in the early stages of language learning, and that the cost of attending to one, is often neglect of the other. Therefore, form-focused instruction does serve a purpose.

1.8 The project: aims, hypotheses and research questions

The purpose of this thesis, as expressed in the initial part of the chapter, is to contribute to the research on second language listening by exploring the ability of second language speakers of English to recognise function words and functional morphemes when listening.

The literature discussed above shows that there are a number of reasons why L2 listeners may not process functors when listening. These include:

- An inability to recognise functors because they are reduced (or elided) through co-articulation
- An inability to notice and recognise functors because they are weakly stressed and lack perceptual salience
- An inability to discriminate the sounds of the functors
- An inability to segment lexical items accurately in continuous streams of speech leading to distractions
- Interference from competitors in the L2 or L1 leading to distractions

- An inability to map the form of the functors onto their mental representations because there is a deficit in mental representations
- An inability to map the form of functors onto their function in the sentence, especially when the functions are expressed differently in the L1
- A lack of automaticity in processing the morpho-syntax of sentences
- An over-reliance on declarative memory and the lexico-semantics of sentences coupled with a deficit in procedural memory
- A deficit in attending to functors in the input resulting in a deficit in their mental entrenchment
- Weak neural associations between the cue and its function
- Weak neural associations between the cue and its schematic role in linguistic constructions
- In respect of auxiliary verbs, modal verbs and past tense inflections: weak associations between the cues and the notions of tense, aspect and modality.

Moreover, as discussed above, there are different views on how L2 listeners can develop their listening skills in respect of functors. These include:

- leaving listeners to develop perceptual skills on their own - as language learners' proficiency levels increase, the belief is that so too will their abilities to discriminate sounds and segment words
- testing listeners' abilities to understand what has been said by focusing on the product of listening through practice exercises
- encouraging listeners to develop their language skills implicitly through exposure to auditory texts and through encouraging extensive listening
- providing explicit instruction on sentence forms and functions through general grammar exercises
- providing instruction that focuses on form, although this is usually limited and mainly focuses on visual messages.

Thus, there are a variety of views and a variety of approaches to enabling L2 listeners to become more accurate in their comprehension of sentences.

The theories on neuro-cognitive aspects of the processing of functors are interesting and do provide insights into the complexities of processing auditory information. They also provide insights into possibilities of how listening may be developed. However, it was

beyond the scope of this thesis to investigate neuro-cognitive aspects of the processing of functors, and the thesis did not aim to add to the debates on connectionism versus other neuro-cognitive aspects of sentence processing. Instead, the thesis was grounded in behavioural studies. The intention with this thesis was to investigate whether, and to what extent, higher level L2 listeners are able to recognise functors when listening to sentences. The thesis assumed that L2 listeners, even with higher language levels, are not able to recognise functors as well as L1 listeners are. If this assumption was found to be true, the intention was further to investigate how a deficit in functor recognition might lead to a deficit in sentence reconstruction at the behavioural level, since it is at this level that people engage in communicative exchanges. In addition, the thesis sought to investigate whether a few hours of training would be able to affect listeners' abilities to notice functors and thereby perform more accurately in reconstructing sentences. The purpose was to contribute to the discussions on what may facilitate higher level L2 listeners to develop their listening skills.

The aims were therefore threefold:

Aims: The first aim with this thesis was to investigate the extent to which L2 listeners to English, with higher rather than lower levels of language proficiency, are able to accurately recognise functors when listening to sentences. The second aim was to investigate possible differences between L2 listeners to English and L1 listeners in respect of being able to recognise functors. The third aim with this thesis was to investigate whether it is possible to positively affect the ability of L2 listeners to recognise and utilise functors in sentences.

The three hypotheses of the thesis were as follows:

Hypothesis 1: L2 listeners will show a deficit in recognising functors accurately compared with L1 listeners even in focused tasks.

Hypothesis 2: Deficits in recognising functors accurately while listening will lead to issues

for listeners in reconstructing the sentences that they listen to.

Hypothesis 3: Training can positively affect the ability of L2 listeners to recognise and utilise functors in sentences.

The thesis aimed to investigate Hypotheses 1 to 3 through the following four research questions:

Research questions

Research question 1: Can, and to what extent do, L2 listeners hear and recognise reduced functors?

Research question 2: Are there differences in the abilities of L2 listeners and L1 listeners to recognise reduced functors in focused listening tasks?

Research question 3: What can we learn from the studies about L2 listeners' abilities in respect of functors?

Research question 4: Can we find techniques to improve L2 listeners' abilities in respect of processing functors and utilizing them in sentence reconstructions?

1.9 General methodological considerations across the seven studies

Seven studies were set up to investigate the research questions and test the hypotheses. The studies were all behavioural and aimed to test listeners' performances. All the studies involved people listening to spoken sentences. In Studies 1 to 5, we aimed to test whether listeners were able to recognise the presence of specific functors in the sentences. In Studies 6 and 7, we tested listeners' abilities to recognise the presence of specific functors in spoken sentences and to reconstruct the sentences using the functors accurately. In Study 7, we additionally tested listeners' abilities to comprehend specific

complex syntactic structures. While Studies 1 to 5 involved participants taking only one testing session, Studies 6 and 7 involved participants taking two commensurate tests and receiving several hours of training. The tests were administered as a pre-training test and a post-training test, with the aim of investigating whether training would enhance listeners' abilities to recognise specific functors and how these are used in sentence constructions. The training involved noticing reduced functors used in different syntactic structures across a range of spoken sentences.

There were three methodological considerations that were common to all seven studies, which we present here, namely ethics, participant recruitment, and materials.

1. Ethics

Ethical approval for the studies in the thesis was sought from, and granted by, the Science and Technology Cross-School Research Ethics Committee at the University of Sussex, approval reference number: ER/NS299/1. The ethical protocol followed in this thesis is that of the British Psychological Society.

All the participants volunteered to take part. The testing and training conducted in the thesis did not constitute a taught course, nor a component of a taught course, for any of the participants. There was therefore no compulsion to take part. Some participants were awarded course credits for taking part; however, the credits were awarded for participation only and not for performance or achievement. Those who were awarded course credits could in fact have chosen to take part in other studies conducted by other researchers – there was no obligation to take part in the studies of this thesis.

At the beginning of each study, each participant was given an explanation of the reasons for the study and of what participation would involve for them. Their role in the study was carefully explained. Each participant was then given a volunteer consent form to read. Apart from asking for their consent to take part in the study and to allow their data

to be used for research purposes and for dissemination of research findings, the consent form also informed participants that they could withdraw from the study at any time and they could withdraw their data. All participants signed the volunteer consent form and agreed that their data could be used for research purposes.

At the end of each test session, participants were invited to give feedback on the session and to ask questions or make comments. They were all informed that they could contact the researcher if they had any follow up questions or if they wanted to be given feedback on their results. Of the participants who attended only one test session, none in fact asked for feedback or results. The case study participants in Studies 6 and 7, who took two sets of tests and received training, were given opportunities to discuss their personal experiences with the language data throughout the training sessions. Moreover, the case study participants were given feedback personally and individually by the researcher in a positive and supportive manner after their final test as a way of concluding their commitments to the study.

2. Participants

Participants were recruited from two different universities in the south-east of England. Some of the participants were awarded course credits, some took part out of interest and were given candies during the testing session and the chance to socialise, the remainder took part as part of a 'participant exchange' incentive and also for a chance to win £25 in a prize draw.

There were four main reasons for working with participants who were studying or working at universities: Firstly, we wanted to work with participants (both L1 and L2) who were able to listen and concentrate for longer lengths of time and who were able to focus on detailed tasks as would be required in the studies. We could assume that students and faculty staff were interested in higher studies, would have demonstrated an ability to concentrate on academic tasks, and were able to focus in test-type situations. They would

also have experienced class- or lecture-types situations which required focused listening in English. In respect of the L2 participants, as they had chosen to work or study in the UK, we could further assume that they would have a certain amount of motivation to perform as well as they could in their L2 English. Secondly, in respect of L2 listeners, we were only interested in the abilities of higher level second language listeners rather than lower level L2 listeners. The English levels of L2 speakers studying or working at UK universities tend to be higher rather than lower, not least as English language entry requirements to universities in the UK are usually set at a minimum of around CEFR high B2. Thirdly, there is currently a considerable amount of interesting work that is being conducted on how an L1 may influence an L2 listener's abilities to process what they hear. The intention with this thesis was not to investigate the influence of different L1s but, rather, to investigate how a group of L2 listeners with a range of L1s perform on average. We believed this was a useful investigation in general for an increasingly globalised world where people communicate in English as a lingua franca, and in particular for an international setting in higher education establishments. Moreover, out of ethical considerations, we did not want to exclude participants on the grounds of their L1. Fourthly, in terms of practical considerations, it was possible to recruit sufficient numbers of committed participants by concentrating recruitment efforts on just two universities rather than searching further afield. This additionally made it easier to set up the testing sessions, since rooms could easily be booked at the two different university campuses to fit in with participants' availability.

3. Materials

All the materials in all the studies were bespoke and written by the author, with one exception: for the training in Study 6 we included a few TV recordings of news headlines and news items from the BBC1 breakfast programme – however, the written transcriptions of the news items and headlines were carried out by the (thesis) author for the Study 6 training sessions.

Chapter 2 – Studies 1 to 5

Research into L2 listeners' abilities to recognise functional morphemes with accuracy

This chapter explains the methodologies for the first five studies (Studies 1 – 5), presents the results, and discusses the implications of the results.

2.1 Research questions, definitions and overview

2.1.i. The three research questions

The overall aim with Studies 1 -5 was to investigate whether L2 listeners are able to recognise functional morpheme suffixes when listening to sentences and how their abilities compare with the abilities of L1 listeners. In these five studies, the three research questions we attempted to answer were:

Research question 1: Can, and to what extent do, L2 listeners hear and recognise reduced functors?

Research question 2: Are there differences in the abilities of L2 listeners and L1 listeners to recognise reduced functors in focused listening tasks?

Research question 3: What can we learn from the studies about L2 listeners' abilities in respect of functors?

2.1.ii. Definition of 'recognise'

As explained in Chapter 1, research suggests that L2 listeners have particular issues around processing functional morphemes. This may be due in part to issues of salience,

since syllables representing functional morphemes are usually unstressed in a spoken sentence (DeKeyser, 2005; Ellis, 2006). It may also be related to issues of lexical segmentation, since most bound morphemes are positioned at word boundaries; thus, if listeners experience issues when segmenting words (e.g. Field, 2001, 2008; Liu, 2002), it is unlikely they will be aware of the functional morphemes at word boundaries. We bear in mind the discussions around difficulties in attending to form and meaning at the same time (e.g. VanPatten, 1990), and Studies 1 – 5 were set up to investigate L2 listeners' abilities to recognise the form of functional morphemes without paying attention to the meaning of the sentence. By **recognise**, we include: to **segment** the words which include the functional morpheme affixes from their neighbours, to **perceive** and to **recognise** the phonemes that represent the functional morphemes, and to **identify** the position of the morpheme in the sentence – i.e. whether the morpheme is affixed to a verb, or whether it is an enclitic of a pronoun or of a modal verb, and so on.

2.1.iii. *Overview*

Studies 1 – 5 were conducted across two higher education establishments in the south-east of England. The participants were mainly students, although Study 5 included four L2 members of staff.

The same 103 participants took part in Studies 1, 2 and 3. In Study 4, there were 24 different participants. In Study 5, the 63 participants were different again from the participants in the other four studies.

Study 1 investigated listeners' abilities to recognise regular verb past tense inflections (-ed verb endings).

Study 2 investigated listeners' abilities to recognise a reduction of the auxiliary verb *have* (*have* → *-ve*) presented as an enclitic either to pronouns or to modal verbs.

Study 3 investigated listeners' abilities to recognise derivational morpheme suffixes.

Study 4 was a follow-on study from Study 1, and investigated further listeners' abilities to recognise inflected morphemes, including past tense inflections on regular verbs (*-ed* verb endings) and plural *-s* inflections on regular nouns.

Study 5 investigated a mix of reduced auxiliary verbs and reduced modal verbs presented as enclitics – reduced auxiliary verbs were encliticized to either pronouns or modal verbs, but reduced modal verbs were encliticized only to pronouns.

We chose to work with participants from Higher Education establishments because the tests in each study required participants to focus their attention on listening for detail and writing appropriate responses. People who study or teach at universities are used to reading and writing as well as to listening and spending longer durations paying attention to what is being said, for instance in lectures and seminars, therefore we believed they would be able to focus and respond as required during the tests. Moreover, if English was not their L1, they would have reached a minimum level of mid B2 on the Common European Framework with Reference to Languages (CEFR) before commencing their studies – normally a minimum of high B2. This was appropriate since the interest in the overall project was in listeners with higher levels of English.

It should be noted that the people in the participant pool had a range of L1s. Therefore, it was not possible to analyse for any possible L1 interference effects for the L2 listeners, as there were not enough participants for each different L1 to warrant statistical analysis.

All the materials in the studies were original and were devised specifically for these studies.

A full version of the test materials from all five studies is presented in Appendix 1 as follows:

Test materials for Study 1 - Appendix 1a.

Test materials for Study 2 - Appendix 1b.

Test materials for Study 3 - Appendix 1c.

Test materials for Study 4 - Appendix 1d.

Test materials for Study 5 - Appendix 1e.

2.2 Study 1 – regular past tense verb inflections

2.2.i. *Aim*

To test L2 listeners' abilities to recognise inflectional morphemes.

In psycholinguistic research there has been considerable interest in regular past tense endings in the debate as to whether L1 listeners process regular verbs with past tense inflected endings as whole words or through decomposition, or both (e.g. Bakker et al., 2013, Seidenberg & Plaut, 2014), and what this says about mechanisms for language processing. The focus in this study was similarly on inflected regular past tense verb endings *-ed*. As explained in Chapter 1, a number of researchers have suggested that L2 listeners are less likely to decompose words through procedural memory than to process them as whole words, and that this varies from the way L1 listeners process words, particularly in relation to inflected verbs (e.g. Ullman, 2005). While it was beyond the scope of this thesis to investigate cognitive mechanisms of processing or to contribute to

the debate on whole-word processing versus decomposition, it was considered useful to explore how accurately L2 listeners were able to recognise suffixed past tense verb endings and how L2 listeners' performances compared with those of L1 listeners from a behavioural point of view.

Thus, the aim with Study 1 was to investigate how accurately L2 listeners are able to recognise inflected regular past tense verb endings and how L2 listeners' performances compare with the performances of L1 listeners. Moreover, the aim was also to explore the question of noticing – that is, whether L2 listeners are able to notice the inflectional past tense morpheme. Evidence for this would be indicated through their ability to recognise past tense endings.

2.2.ii. *Method*

Participants

One hundred and three undergraduate and postgraduate students took part in the study. The L2 listeners' first languages were Arabic, Cantonese, Chinese, Dutch, French, Italian, Japanese, Korean, Persian, Portuguese, Slovenian, Spanish, Thai and Turkish; thus there was a range of first languages as would be expected in a Higher Education establishment.

Sixty-five of the participants were L2 speakers, with language levels ranging from mid B2 to high C1/low C2 on the Common European Framework with Reference to Languages (CEFR) – roughly equivalent to IELTS scores of 5.5 – 8.0/8.5. In this study we included participants who were studying on a pre-session course preparing to start their undergraduate or postgraduate programmes two months later. Forty of the pre-session participants' English language levels were just under the required IELTS 6.5 entry threshold for their universities and equated roughly to IELTS 5.5 – 6.0 (CEFR mid B2), but five of the people on the pre-session course had already achieved scores of IELTS 6.5.

The information about first languages, language scores, time spent in the UK, age groups, and gender were obtained from a language-profile form attached to the front of the test booklets. In addition, we were given access to the pre-sessional participants' range of scores by the course leader. However, the eleven participants on postgraduate courses did not have up-to-date English language scores since they were tested for this study in June, and their English tests had been taken at least fifteen previously. We therefore do not have exact scores for some of the participants; however, from the data on the information sheets, we know that the scores of the 20 participants who were not on the pre-sessional course ranged from IELTS 6.5 – 8.0/8.5.

Table 1. The 103 participants who took part in Studies 1, 2 and 3.

English as L1 or L2	First languages	Age groups	Gender	Stage of study	Time in the UK	English levels for L2 participants in IELTS equivalences
L1 N = 38	English	18-21 x 32 (f = 29) 22-25 x 1 (f) 26-35 x 3 (f) 36-55 x 2 (f)	female x 35 male x 3	undergraduate x 36 postgraduate x 2	n/a	n/a
L2 N = 65	Arabic x 7 Cantonese x 1 Chinese x 16 Dutch x 1 French x 1 Italian x 1 Japanese x 2 Korean x 1 Kurdish x 1 Persian x 1 Portuguese x 17 Slovenian x 1 Spanish x 4 Turkish x 2	18-21 x 21 (f = 12) 22-25 x 27 (f = 18) 26-35 x 14 (f = 9) 36-55 x 3 (f = 2)	female x 41 male x 24	undergraduate x 9 postgraduate x 11 pre-sessional x 45 (of whom approx. 1/3 was going on to study at undergraduate level, 2/3 at postgraduate level).	mean = 0.55 years. The range was 1 month to 3.5 years with: 1–6 months x 45 9-18 months x 15 2 years x 3 3 years x 1 3.5 years x 1	5.5 x 22 6.0 x 18 6.5 x 5 6.5 – 8.0/8.5 x 20

Materials and test design

Test materials comprised:

- a) Recordings of 90 individual sentences, each with a different meaning, spoken by an adult male L1 English speaker with a standard accent from the southeast of England. The recordings were divided into two sets, each containing 45 sentences.
- b) A paper-based response booklet, in which the numbers 1 – 90 were printed, one number for each sentence. Participants were asked to write a response for each sentence next to its item number. Instructions and examples were printed in the booklet before the item numbers for the first set and again for the second set before the numbers for the second set.

The first set of 45 sentences were short, comprising 4 - 6 words (7 - 8 syllables) each; the second set of sentences were longer, comprising 10 – 15 words (17 – 18 syllables) each. Each sentence contained one regular verb presented either in the present tense (15 sentences in each set) or in the past tense (30 sentences in each set). To limit cognitive load, the sentences were declarative and simple. They further excluded negatives and questions to avoid the use of auxiliary verbs. The longer sentences contained adjectives and adverbs and were fronted by an adverbial phrase to make them longer.

There were no time markers nor any contextual information that would act as cues as to whether the verb was in the present tense or the past tense. The only cue to tense was the past tense ending itself, or the lack of it.

Examples of shorter sentences:

You attended all the classes

We enjoyed all our lessons

You plan your essay carefully

I worked hard before my exams

Examples of longer sentences:

In the evenings, we talked about many different and interesting things

Often at conferences, new presenters sounded less confident at first

After the exams, the students relax for as long as possible

Nearly every day, we emailed our old friends at home after our lectures

The past tense *-ed* ending may be articulated as /d/, /t/ or /ɪd/: /d/ as in *lived*, /t/ as in *kicked* or *puffed*, /ɪd/ as in *visited*. How the *-ed* is articulated depends on the final sound of the verb. If the final sound is voiced, the *-ed* ending will be articulated as the voiced /d/. If the final sound is unvoiced, the *-ed* ending will be articulated as the unvoiced /t/. If the final sound is /d/ or /t/, the *-ed* ending is articulated as /ɪd/, as it could otherwise not be articulated.

The three different articulations of the past tense ending were presented equally (ten times each) in each of the two sets, hence thirty sentences with verbs in the past tense.

Sentence constructions wherein the articulation of the inflected regular past tense verb ending assimilated with the initial sounds of the following word, or were elided, (as in '*jumped down*', or '*fetched the*'), were avoided in all but one item to ensure that the past tense ending was audible.

(In the second set of longer sentences, one sentence was included in which the past tense ending was more or less inaudible due to co-articulation: *Additionally, they managed their work efficiently and professionally*. The responses to this sentence were mixed, so the item was removed before analysis, and results were calculated on their being 9 items instead of 10 in the /d/ category for longer sentences.)

Procedure

Before listening to each set of 45 sentences, participants read written instructions and examples, after which the experimenter explained instructions orally and checked understanding. Following that, participants listened to the examples they had just read to familiarise themselves with the speaker's voice and for the procedure to be demonstrated. Reminders of how to respond were given on each page of the booklet.

Participants were asked to write **1** in the item response box if the verb was in the present tense – that is, if they did not hear the regular past tense *-ed* ending. They were asked to write **2** in the box if the verb was in the past tense – that is, if they heard the past tense ending.

Extract of instructions and examples in the response booklet:

In this part you will hear some sentences which are either in the present tense or the past tense.

Write 1 if the verb in the sentence is in the present tense (e.g. invite, agree, kick)

Write 2 if the verb in the sentence is in the past tense (if you hear the *-ed* ending on the verb, e.g. invited, agreed, kicked)

Example

We invite our parents to lunch

1

We wanted the newest book

2

They discussed all the points

2

The item number was written to the left of the item response box and was also said before each sentence to ensure that responses were entered in the correct boxes, as seen below:

1.

2.

Participants listened to the recorded sentences once only.

Perceptual processing is ephemeral - after a few seconds the speech signal in its exact form is lost to memory and what remains is the meaning of the sentence rather than its form (Flowerdew & Miller, 2005; Garnham, 1985). Radford, Atkinson, Britain, Clahsen & Spencer (2009) suggest that memory for syntax is unreliable only half a minute after a sentence has been heard, making the exact form of the sentence transient. Due to this, participants were asked write their responses immediately on hearing a sentence so that issues related to memory could be reduced. Participants therefore wrote their item response in the test booklet as each sentence was playing or immediately after each sentence finished and before the next sentence was played. Participants were asked to write a response for each item even if they were not completely sure of what they had heard.

There was no time pressure as the focus of the investigation was to ascertain ability to hear the morpheme. The experimenter allowed a couple of seconds between each sentence to ensure everyone in the group had finished responding - when testing participants with slightly lower English levels, a few additional seconds were allowed to reduce the risk of mental fatigue. Moreover, a break of roughly 2 minutes was allowed between the two sets of sentences to avoid fatigue.

Participants were tested in several groups of varying sizes depending on their availability. All participants were tested by the same experimenter to ensure consistency.

2.2.iii. *Analyses and Results*

The participants' responses show that two types of error were made: not hearing the morpheme, or imagining they heard it when it had not been said. We termed the types of error as 'not heard' and 'illusory'. Participants in both the L1 and the L2 group made both types of error.

When looking at the results, it appeared that three items had been problematic. When we re-checked the sound recordings, we found room for error in determining whether or not the functional morpheme was present due to co-articulation. These three items were then removed from the data – one of the three was the item mentioned above. The usable data then comprised:

- 29 items with past tense endings in the short sentences
- 29 items with past tense endings in the long sentences
- 15 items with verbs in the present tense in the short sentences
- 14 items with verbs in the present tense in the long sentences

Total number of items = 87.

The accuracy rate for each participant was therefore calculated as follows:

- Overall accuracy for the set of short sentences = number of correct responses/44 items (44 = total number of items for the short sentences)
- Overall accuracy for the set of long sentences = number of correct responses/43 items (43 = total number of items for the long sentences).

The error rate for each participant for each type of error was calculated as follows:

- Error rate for past tense, short sentences = no. of incorrect responses/29 items
- Error rate for present tense, short sentences = no. of incorrect responses/15 items
- Error rate for past tense, long sentences = no. of incorrect responses/29 items
- Error rate for present tense, long sentences = no. of incorrect responses/14 items.

To allow comparisons, accuracy rates and errors rates for each person were converted into percentages using the Microsoft Excel package. To calculate the percentages, we used the formula: no of (in)correct responses X 100 / no of items.

Independent samples t-tests were run in SPSS version 25 to verify the significance of the mean differences between the groups.

As Table 2 below shows, accuracy in the L1 group was very high with some participants achieving 100% correct responses. The L2 group did not perform as well overall, and had more varied performance.

Table 2. Mean overall accuracy rates for the L1 and L2 groups, with mean rates of 'not heard' errors and mean rates of 'illusory' errors. Rates shown in %, and shown together with standard deviation (SD) and standard errors of the mean (SEM). *d* = Cohen D effect size for the differences between L1 and L2 listeners.

Group	Overall accuracy in recognizing past tense endings		'Not heard' errors		'Illusory' errors	
	<i>Short sent.</i>	<i>Long sent.</i>	<i>Short sent.</i>	<i>Long sent.</i>	<i>Short sent.</i>	<i>Long sent.</i>
L1	97.1	91.3	1.9	4.7	4.9	16.9
N = 38	SD = 4.12 SEM = .67	SD = 6.30 SEM = 1.02	SD = 5.88 SEM = .95	SD = 8.22 SEM = 1.33	SD = 5.30 SEM = .86	SD = 10.94 SEM = 1.78
L2	79.8	68.0	20.5	33.4	19.8	28.8
N = 65	SD = 9.52 SEM = 1.18	SD = 10.48 SEM = 1.30	SD = 11.47 SEM = 1.42	SD = 14.37 SEM = 1.78	SD = 11.83 SEM = 1.47	SD = 14.17 SEM = 1.76
Difference between L1 and L2 groups	17.3*** SEM = 1.36 <i>d</i> = 2.36	23.3*** SEM = 1.65 <i>d</i> = 2.69	18.6*** SEM = 1.71 <i>d</i> = 2.04	28.7*** SEM = 2.23 <i>d</i> = 2.45	14.9*** SEM = 1.70 <i>d</i> = 1.63	11.9*** SEM = 2.50 <i>d</i> = 0.94

***Significant at the .001 level.

**Significant at the .01 level.

*Significant at the .05 level.

Overall accuracy rates were calculated based on total number of items. However, the rates for the two types of error were based on how many errors of that type were possible. For L1 listeners, 'not heard' errors were made for 1.9% of the past tense items in the short sentences, and for 4.7% of the past tense items in the long sentences. In contrast, the L2 group, on average, did not hear the past tense ending for 20.5% of the past tense items in the short sentences, and for 33.4% of the past tense items in the long sentences.

In respect of illusory errors, the average error rate for the L1 listeners was 4.9% in the short sentences and 16.9% in the long sentences. It would therefore seem that the tendency for L1 listeners was to hear past tense endings that did not exist rather than not hearing the ones that had been said. For the L2 listeners, the trend was different. They made approximately the same rate of not heard errors as illusory errors (around 20%) in the short sentences. In the long sentences, the L2 group's error rate for not hearing the past tense ending was higher than their error rate for imagining endings that had not been said.

Independent samples t-tests showed that there were significant differences in all results between the L1 and the L2 groups. In all tests, $p = .000$. Cohen D tests to assess effect sizes showed these to be large, that is $d > 0.8$.

In Studies 5, 6 and 7, we worked only with participants who had already started their university programmes and not with participants who were at pre-sessional stage. In the interests of comparability, we ran the tests again, this time only with participants whose English language scores could be assumed to be at IELTS 6.5 or higher (CEFR high B2 +). That was, excluding participants who had not started their degree programmes. In this case, we referred to the L2 group as L2-higher to distinguish the smaller L2 group from the whole L2 group, and to indicate that the smaller group only included the higher level

participants whose English levels were at IELTS 6.5 or higher. The results are shown in Table 3.

Table 3. Mean overall accuracy rates for the L1 and L2-higher groups, with mean rates of ‘not heard’ errors and mean rates of ‘illusory’ errors. Rates shown in %, and shown together with standard deviation (SD) and standard errors of the mean (SEM). d = Cohen D effect size for the differences between L1 and L2 listeners.

Group	Overall accuracy in recognizing past tense endings		‘Not heard’ errors		‘Illusory’ errors	
	<i>Short sent.</i>	<i>Long sent.</i>	<i>Short sent.</i>	<i>Long sent.</i>	<i>Short sent.</i>	<i>Long sent.</i>
L1	97.1	91.3	1.9	4.7	4.9	16.9
N = 38	SD = 4.12 SEM = .67	SD = 6.30 SEM = 1.02	SD = 5.88 SEM = .95	SD = 8.22 SEM = 1.33	SD = 5.30 SEM = .86	SD = 10.94 SEM = 1.78
L2-higher	83.8	73.3	17.3	26.5	14.4	27.1
N = 25	SD = 8.95 SEM = 1.79	SD = 10.42 SEM = 2.08	SD = 12.64 SEM = 2.53	SD = 14.76 SEM = 2.95	SD = 10.30 SEM = 2.06	SD = 17.12 SEM = 3.42
Difference between L1 and L2-higher groups	13.3*** SEM = 1.91 $d = 1.92$	18.0*** SEM = 2.32 $d = 2.09$	15.4*** SEM = 2.70 $d = 1.56$	21.8*** SEM = 3.24 $d = 1.82$	9.5*** SEM = 2.23 $d = 1.16$	10.2* SEM = 3.53 $d = 0.71$

***Significant at the .001 level.

**Significant at the .01 level.

*Significant at the .05 level.

The differences between the L1 listeners and the L2 listeners in the smaller L2-higher group remained significant. In all categories, apart from the illusory errors in the longer sentences, the differences were still significant at the .000 level, and the effect sizes were large, with $d > 0.8$. For the illusory errors in the longer sentences, the difference was now significant at the .05 level, and the effect size was smaller, with $0.5 < d < 0.8$ – that is the effect size was between medium and large²⁵.

²⁵ By convention, the effect size is deemed to be low if it is > 0.2 , medium if it is > 0.5 , and large if it is > 0.8 .

The results show clearly that the mean rate of accuracy decreased when sentences were lengthened, both for the L1 listeners and the L2 listeners. However, the rise was not proportional between the two groups. The mean difference between the L1 group and the L2 group (whether measured for the whole L2 group or for the smaller L2-higher group) was greater when the sentences were longer.

In respect of the proportions of 'not heard' errors and 'illusory' errors:

- L1 listeners made proportionately more 'illusory' errors than 'not heard' errors.
- L2 listeners in the whole L2 group made around the same amount of 'not heard' errors as 'illusory' errors in the shorter sentences, but more 'not heard' errors in the longer sentences.
- L2-higher listeners: the pattern was different for the smaller L2-higher group from the whole L2 group, as the L2-higher listeners made more 'not heard' errors in the shorter sentences, but around the same amount of 'not heard' as 'illusory' errors in the longer sentences.

Since the error patterns for the L2-higher group were different from the patterns for the whole L2 group in respect of 'not heard' errors versus 'illusory' ones, for comparison purposes we ran the analysis for the remaining L2 participants who had not been included in the L2-higher group. As their English language levels were slightly lower, we referred to this group as L2-lower. The comparisons between the L2-higher and the L2-lower groups are given in Table 4. The patterns of the L2-lower group were the same as the patterns for the whole L2 group in terms of the percentage of error types. Thus it was the pattern of the L2-lower group that influenced the overall results in terms of the differences between the 'not heard' and the 'illusory' errors.

Table 4. Mean overall accuracy rates for the L2-higher group compared with the L2-lower group, with mean rates of 'not heard' errors and mean rates of 'illusory' errors. Rates shown in %, and shown together with standard errors of the mean. d = Cohen D effect size for the differences between L2-higher and L2-lower listeners.

Group	Overall accuracy in recognizing past tense endings		'Not heard' errors		'Illusory' errors	
	<i>Short sent.</i>	<i>Long sent.</i>	<i>Short sent.</i>	<i>Long sent.</i>	<i>Short sent.</i>	<i>Long sent.</i>
L2-higher	83.8	73.3	17.3	26.5	14.4	27.1
N = 25	SD = 8.95 SEM = 1.79	SD = 10.42 SEM = 2.08	SD = 12.64 SEM = 2.53	SD = 14.76 SEM = 2.95	SD = 10.30 SEM = 2.06	SD = 17.12 SEM = 3.42
L2-lower	77.3	64.7	22.5	37.8	23.1	29.8
N = 40	SD = 9.12 SEM = 1.44	SD = 9.21 SEM = 1.46	SD = 10.33 SEM = 1.63	SD = 12.43 SEM = 1.96	SD = 11.58 SEM = 1.83	SD = 12.09 SEM = 1.91
Difference between L2-higher and L2-lower groups	6.5** SEM = 2.30 $d = 0.72$	8.6** SEM = 2.54 $d = 0.87$	5.2 ^{ns} SEM = 3.01 $d = 0.45$	11.3** SEM = 3.55 $d = 0.83$	8.7** SEM = 2.76 $d = 0.79$	2.7 ^{ns} SEM = 3.92 $d = 0.18$

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} $p > .05$.

Additionally, the results in Table 4 show that the differences between the L2-higher and the L2-lower group were much smaller than the differences between the L1 and the L2-higher group, as were the effect sizes. In fact, in respect of the 'not heard' errors in the short sentences and the 'illusory' errors in the longer sentences, the differences between the two groups were not significant. For the 'not heard' errors in the short sentences, the effect size was small; for the 'illusory' errors in the longer sentences, there was no real effect size.

A t-test of repeated measures analysis in SPSS version 25 showed the differences between proportions of 'not heard' errors and 'illusory' errors were significant only for the L1 group in both the short and the longer sentences, and only for the L2-lower group in the longer sentences. Differences were not significant for the L2 group as a whole nor for the L2-

higher group. The results are shown in Table 5. The plus sign shows that there were more 'illusory' errors than 'not heards', the minus sign shows there were fewer 'illusory' errors.

Table 5. The difference between the % of 'not heard' errors and the % of 'illusory errors'. + = more 'illusory' errors than 'not heards'; - = fewer 'illusory' errors than 'not heards'.

	L1 group	L2 group (whole group)	L2-higher group	L2-lower group
Short sentences	+ 3.0 *	- 0.7 ^{ns}	- 2.9 ^{ns}	+ 0.6 ^{ns}
	SD = 8.26 SEM = 1.34 d = 0.36	SD = 13.96 SEM = 1.73 d = 0.05	SD = 16.53 SEM = 3.31 d = 0.18	SD = 12.11 SEM = 1.92 d = 0.05
Longer sentences	+ 12.2 ***	- 4.6 ^{ns}	+ 0.6 ^{ns}	- 8.0 **
	SD = 14.31 SEM = 2.32 d = 0.85	SD = 20.84 SEM = 2.58 d = 0.05	SD = 24.76 SEM = 4.95 d = 0.02	SD = 17.50 SEM = 2.77 d = 0.46

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} p > .05.

Thus, on the few occasions that L1 listeners made errors, these were more likely to be illusory errors than errors of omission. When L2 listeners made errors, these were more likely to be a fairly equal mix of both types of error in the main; however, the lower level L2-lower group made such a high amount of 'not heard' errors in the longer sentences, that the proportion of 'not heards' rose compared with 'illusions'.

To investigate whether overall performance in accuracy on the shorter and longer sentences was correlated for individuals, we ran a Spearman's rho test for correlation in SPSS version 25. This showed that performance was strongly correlated for individuals across the L2 group, but only weakly correlated for the L1 listeners.

- L1 listeners: the correlation coefficient r was .330, $p = .043$
- L2 listeners (whole group, $N = 65$): $r = .766$, $p = .000$
- L2-higher listeners ($N = 25$): $r = .730$, $p = .000$
- L2-lower listeners ($N = 40$): $r = .759$, $p = .000$.

This would suggest that errors made by L1 listeners were fairly random. However, L2 listeners who made errors with the short sentences were more likely also to make errors with the long sentences.

Finally, we investigated whether listeners were able to hear the /ɪd/ articulation of the -ed morpheme with more accuracy than the /d/ and /t/ articulations, given that /ɪd/ was articulated as a separate syllable and was therefore more salient. The results are shown in Tables 6 and 7.

Table 6. Percentage of 'not heard' errors (out of total trials) within each of the three -ed morpheme articulation categories: /d/, /t/, /ɪd/.

Group	Short sent.	Short sent.	Short sent.	Long sent.	Long sent.	Long sent.
	/d/	/t/	/ɪd/	/d/	/t/	/ɪd/
L1	1.45	2.63	1.58	5.40	4.74	4.48
L2	22.14	34.92	4.15	48.22	33.19	23.34
L2-higher	19.04	30.40	1.60	41.28	25.80	14.60
L2-lower	24.08	37.75	5.75	51.25	36.50	27.50

Table 7. Differences within group between the three *-ed* morpheme articulation categories in percentage of ‘not heard’ errors. Differences shown together with standard deviations and standard errors of the mean.

Group	Short sent. <i>Diff between /d/ and /t/</i>	Short sent. <i>Diff between /d/ and /ɪd/</i>	Short sent. <i>Diff between /t/ and /ɪd/</i>	Long sent. <i>Diff between /d/ and /t/</i>	Long sent. <i>Diff between /d/ and /ɪd/</i>	Long sent. <i>Diff between /t/ and /ɪd/</i>
L1	1.18 ^{ns} SD = 6.19 SEM = 1.00 d = 0.19	0.13 ^{ns} SD = 5.99 SEM = .97 d = 0.02	1.05 ^{ns} SD = 7.98 SEM = 1.30 d = 0.13	0.66 ^{ns} SD = 8.85 SEM = 1.44 d = 0.07	0.92 ^{ns} SD = 8.45 SEM = 1.37 d = 0.11	0.26 ^{ns} SD = 10.26 SEM = 1.66 d = 0.10
L2	12.78 *** SD = 21.75 SEM = 2.70 d = 0.59	17.99 *** SD = 20.70 SEM = 2.56 d = 0.87	30.77 *** SD = 21.16 SEM = 2.62 d = 1.45	15.03 *** SD = 23.59 SEM = 2.92 d = 0.64	24.88 *** SD = 24.25 SEM = 3.01 d = 1.03	9.85 *** SD = 21.83 SEM = 2.71 d = 0.45
L2-higher	11.36 ** SD = 19.32 SEM = 3.86 d = 0.59	17.44 *** SD = 22.17 SEM = 4.43 d = 0.79	28.80 *** SD = 21.86 SEM = 4.37 d = 1.32	15.48 *** SD = 17.44 SEM = 3.49 d = 0.89	26.68 *** SD = 27.50 SEM = 5.50 d = 0.97	11.20 * SD = 24.55 SEM = 4.91 d = 0.46
L2-lower	13.67 *** SD = 23.34 SEM = 3.69 d = 0.59	18.33 *** SD = 20.01 SEM = 3.16 d = 0.92	32.00 *** SD = 20.90 SEM = 3.31 d = 1.53	14.75 *** SD = 26.94 SEM = 4.26 d = 0.55	23.75 *** SD = 22.27 SEM = 3.52 d = 1.07	9.00 ** SD = 20.23 SEM = 3.20 d = 0.45

*** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$, ^{ns} $p > .05$

In respect of whether the more salient separate syllable /ɪd/ articulation was easier for the listeners to recognise than the /d/ and /t/ articulation of the inflected past tense morpheme showed mixed results.

- L1 listeners: in the very few ‘not heard’ errors made by the L1 listeners, we did not find a significant difference between the error rate of the three articulations, nor was there an effect size.
- L2 listeners: the patterns of the two smaller L2 groups (L2-higher and L2-lower) was the same as the pattern of the whole L2 group. Results show that the L2 listeners did perform more accurately with the /ɪd/ articulation across both sets of

sentences. L2 listeners had most difficulty with /t/ in the short sentences and with /d/ in the long sentences and much less difficulty with the more salient /ɪd/ across both sets of sentences. The differences were significant.

It is possible that the difference between the short and the longer sentences in respect of the /d/ and /t/ articulations was due to the nature of the sentences. This question was re-visited later in Study 4.

2.3 Study 2 – Reduced auxiliary verb clitics

2.3.i. *Aim*

Auxiliary verbs and modal verbs are free morphemes; however, when they are reduced they become encliticised to the word that precedes them. Thus, as S. R. Anderson (2008) and Ellis (2006) point out, they become similar to functional morphemes in their surface form. Marantz (2013) similarly suggested that function words could be placed in the same category as functional morphemes. Ellis (2006), pointed out that clitic could be as difficult for L2 listeners to hear as inflected endings. It was therefore considered important to investigate reduced auxiliary and modal verbs to gain a fuller understanding of the difficulties that L2 listeners have. The aim with this study was twofold: to investigate L2 listeners' abilities to recognise reduced auxiliary verbs in connected speech, and to investigate how easily listeners were able to recognise where the auxiliary verbs were positioned in a sentence, that is whether they were encliticised to a pronoun or to a modal verb.

2.3.ii. *Method*

Participants

After completing Study 1 and having a break of eight to ten minutes, the same 103 participants then took part in this study. L1 = 38 participants, L2 = 65 participants (L2-higher = 25 participants, L2-lower = 40 participants).

Materials and test design

Test materials comprised recordings of 60 sentences and a paper-based response booklet. As in Study 1, the sentences were divided into two sets of declarative sentences: 30 were short and simple comprising one clause of 5 – 6 words (6 – 8 syllables), and 30 were longer, comprising two clauses of 10 – 15 words (16 – 18 syllables). The sentences were spoken by an adult female L1 English speaker from the southeast of England with a fairly standard accent.

Each set of sentences comprised:

- 10 sentences with a pronoun + reduced auxiliary verb (have) clitic
- 10 sentences with a modal verb + reduced auxiliary verb (have) clitic
- 10 sentences without a clitic

distributed as follows:

<u>Pronoun plus have</u>	<u>Modal plus have</u>	<u>No clitics</u>
<i>I've</i> x 2	<i>would've</i> x 2	10 random sentences without an auxiliary verb
<i>you've</i> x 2	<i>could've</i> x 2	
<i>we've</i> x 3	<i>should've</i> x 2	
<i>they've</i> x 3	<i>might've</i> x 2	
	<i>may've</i> x 2	

In the longer sentences, the reduced version of the auxiliary verb was in the second clause.

Examples of shorter sentences:

<i>We've emailed our professor</i>	Pronoun + -ve
<i>We should've arrived there early</i>	Modal + -ve
<i>You could've joined the other group</i>	Modal + -ve
<i>We could call them before breakfast</i>	No -ve
<i>You organised your work well</i>	No -ve

Examples of longer sentences:

<i>I was sure that he would've asked them for some help with his project</i>	Modal + -ve
<i>The professor said that the students could've studied the text much better</i>	Modal + -ve
<i>The teacher wants to know if you've looked at all the books on the reading list</i>	Pronoun + -ve
<i>The students thought that the professor would explain the project again</i>	No -ve
<i>The students believe that they worked as much as possible on their essays</i>	No -ve

The task for participants was to note whether the sentence contained a reduced auxiliary verb and, if so, whether it was a pronoun clitic or a modal verb clitic.

The main verbs following the clitics were regular verbs. There were no semantic cues as to whether the sentence contained a clitic. Sentences which contained pronoun clitics had no syntactic cues either to prime the participants as to whether the sentence expressed the simple past (e.g. they *walked*) or the present perfect (e.g. they've *walked*).

Modal verb clitic sentences, however, contained a syntactic cue which could facilitate the recognition of the auxiliary verb, namely whether the lexical (content) verb was in the infinitive (e. g. they could *walk* there) or whether it was in its past participle form (e. g. they could've *walked* there). This cue was unavoidable if the sentences were to remain grammatical. Two things were done to reduce the noticeability of the past participle inflected *-ed* morphemes on the lexical verbs and thereby to reduce the syntactic sentence cue:

- only regular lexical verbs whose past tense endings are pronounced /d/ or /t/ were used rather than verbs with past participles which are more noticeable, such as irregular verbs or verbs with endings pronounced as a separate syllable /ɪd/

- the initial sound of the word following the lexical verb began with a /d/, /t/, /θ/ or /ð/ sound – thus there was a linking effect between the *-ed* inflected suffix of the verb and the initial sound of the following word, making it less easy for the listener to determine whether the verb was in its infinitive form or its past participle form (- e.g. the difference between *They could watch TV* and *They could've watched TV* is mainly only noticeable because of the *-ve* syllable, as the *-ed* suffix of *watched* blends with the /t/ sound of *TV*).

Test booklets included written instructions and examples and a response key reminder on each page. Item numbers were given next to each response box.

Example of the instructions given for the short sentences:

In this study, you will hear a range of different sentences. Some of them will include the auxiliary verb 'have' in its reduced form 've.

It may be attached to a pronoun (e.g. I've been, you've discovered, we've done, they've listened),

or it may be attached to a modal verb (e.g. I could've been, you would've discovered, we may've done, I might've finished, they should've listened).

Please listen to the sentences. Please note in the response booklet if the sentence includes the auxiliary verb have. If it does, it will be said in its reduced form.

Please write your responses in the boxes.

Write P if have is attached to a pronoun (I've, you've, we've, they've)

Write M if have is attached to a modal verb (could've, would've, should've, may've, might've)

Write X if the sentence does not include have

Please write a response for each sentence.

Example

i. They've called three times today

P

ii. We talked to all the teachers

X

iii. You've answered the question quickly

P

iv. We would've liked cake with our tea

M

v. They should dance to jazz music

X

vi. I may've finished before lunch

M

Procedure

As in Study 1, participants received both written and oral instructions, and the experimenter checked comprehension. Participants were asked to write P, M or X next to each item number in the test booklet as they listened to each sentence: P if they heard the reduced auxiliary verb as a pronoun clitic; M if they heard the reduced auxiliary verb as a modal verb clitic; and X if there was no reduced auxiliary verb. Participants also read and listened to examples to familiarise themselves with the task and the speaker's voice. The sentences were played once only, and the set of 30 short sentences was played first, followed by the set of 30 long ones. Participants were given time to think about their responses, which was necessary given the additional cognitive load associated with the task. As with the other studies, we were investigating whether participants were able to recognise the reduced auxiliaries in spoken sentences and did not want to put them under time pressure.

1.3.iii. *Analyses and Results*

In this study we found three types of error: 'not heard' (missed) morphemes, 'illusory' morphemes, and hearing the morpheme but identifying its position incorrectly ('confused'). Results were analysed in SPSS version 25. Independent samples T-tests were used to verify the significance of the differences between groups.

The accuracy rate for each participant was calculated as follows:

-Overall accuracy for each set of sentences = number of correct responses/30 sentences (30 = total number of items in the set)

The error rate for each participant for each type of error was calculated as follows:

-Error rate for 'not heard' errors, short sentences = no. of incorrect responses/20 items

-Error rate for 'illusory' errors, short sentences = no. of incorrect responses/10 items

-Error rate for 'confused' errors, short sentences = no. of incorrect responses/20 items

-Error rate for 'not heard' errors, long sentences = no. of incorrect responses/20 items

-Error rate for 'illusory' errors, long sentences = no. of incorrect responses/10 - items

-Error rate for 'confused' errors, long sentences = no. of incorrect responses/20 Items.

Accuracy rates and errors rates for each person were converted into percentages using the Excel package to allow comparisons. To calculate the percentages, we used the formula: no of (in)correct responses X 100 / no of items.

Table 8. Mean overall accuracy rates for the L1 and L2 groups, with mean rates of 'not heard' errors, mean rates of 'illusory' errors, and mean rates of 'confused' errors. Rates shown in %, and shown together with standard deviation (SD) and standard errors of the mean (SEM). d = Cohen D size effect for the differences between L1 and L2 listeners.

Group	Overall accuracy in recognizing past tense endings		'Not heard' errors		'Illusory' errors		'Confused' errors	
	<i>Short sent.</i>	<i>Long sent.</i>	Short sent.	Long sent.	Short sent.	Long sent.	Short sent.	Long sent.
L1	98.4	95.4	1.6	3.0	1.1	7.1	0.26	0.39
N = 38	SD = 2.53 SEM = .41	SD = 6.03 SEM = .98	SD = 2.62 SEM = .43	SD = 5.76 SEM = .93	SD = 5.09 SEM = .83	SD = 9.84 SEM = 1.60	SD = 1.31 SEM = .18	SD = 1.37 SEM = .22
L2	80.2	70.4	13.1	24.1	23.1	25.7	4.8	7.5
N = 65	SD = 12.82 SEM = 1.59	SD = 15.07 SEM = 1.89	SD = 9.99 SEM = 1.24	SD = 15.55 SEM = 1.92	SD = 19.20 SEM = 2.38	SD = 19.44 SEM = 2.41	SD = 7.87 SEM = .98	SD = 9.23 SEM = 1.15
Difference between L1 and L2 groups	18.2*** SEM = 1.64 $d = 1.97$	25.0*** SEM = 2.11 $d = 2.18$	11.5*** SEM = 1.66 $d = 1.57$	21.1*** SEM = 2.14 $d = 1.80$	22.0*** SEM = 3.18 $d = 1.57$	18.6*** SEM = 2.90 $d = 1.21$	4.5*** SEM = .99 $d = 0.80$	7.1*** SEM = 1.67 $d = 1.08$

***Significant at the .001 level.

**Significant at the .01 level.

*Significant at the .05 level.

As in Study 1, a number of listeners in the L1 group performed 100% accurately and the group as a whole made very few errors. L2 listeners were less accurate, and more variable. Performance on short sentences was again better than performance on long sentences for both groups.

As in Study 1, we made a breakdown of the errors for the L2-higher and the L2-lower groups, as shown in Table 9.

Table 9. Mean overall accuracy rates for the L1, L2-higher and L2-lower groups, with mean rates of 'not heard' errors, mean rates of 'illusory' errors, and mean rates of 'confused' errors. Rates shown in %, and shown together with standard deviation (SD) and standard errors of the mean (SEM).
d = Cohen D effect size for the differences between L1 and L2-higher listeners, and the differences between the two L2 groups.

Group	Overall accuracy in recognizing past tense endings		'Not heard' errors		'Illusory' errors		'Confused' errors	
	Short sent.	Long sent.	Short sent.	Long sent.	Short sent.	Long sent.	Short sent.	Long sent.
L1	98.4	95.4	1.6	3.0	1.1	7.1	0.26	0.39
N = 38	SD = 2.53 SEM= .41	SD = 6.03 SEM= .98	SD = 2.62 SEM= .43	SD = 5.76 SEM= .93	SD = 5.09 SEM = .83	SD = 9.84 SEM=1.60	SD = 1.31 SEM= .18	SD = 1.37 SEM= .22
L2-higher	86.3	77.7	9.2	18.2	16.0	22.40	3.0	4.4
N = 25	SD = 8.46 SEM=1.69	SD =14.30 SEM=2.86	SD = 8.38 SEM=1.68	SD =16.39 SEM=3.28	SD =12.91 SEM=2.58	SD =16.65 SEM=3.33	SD = 5.59 SEM=1.12	SD = 6.18 SEM=1.24
L2-lower	76.5	65.8	15.5	27.9	27.5	27.8	5.9	9.5
N = 40	SD =13.71 SEM=2.17	SD =13.83 SEM=2.19	SD =10.24 SEM=1.62	SD =13.95 SEM=2.21	SD =21.21 SEM=3.35	SD =20.94 SEM=3.31	SD = 8.91 SEM=1.41	SD =10.30 SEM=1.63
Difference between L1 and L2-higher groups	12.1*** SEM=1.74 d =1.94	17.7*** SEM=3.02 d =1.61	7.6*** SEM=1.73 d =1.22	15.2*** SEM=3.41 d =1.24	14.9*** SEM=2.71 d =1.52	15.3*** SEM=3.69 d =1.12	2.7* SEM=1.13 d =0.67	4.0** SEM=1.26 d =0.90
Difference between L2-higher and L2-lower groups	9.8*** SEM=2.75 d =0.86	11.9** SEM=3.60 d =1.27	6.3* SEM=2.33 d =0.67	9.7* SEM=3.95 d =0.64	11.5** SEM=4.23 d =0.65	5.4 ^{ns} SEM=4.70 d =0.29	2.9 ^{ns} SEM=1.80 d =0.39	5.1* SEM=2.04 d =0.60

***Significant at the .001 level.

**Significant at the .01 level.

*Significant at the .05 level.

The pattern of errors in the two L2 subgroups was the same as in the whole L2 group, with listeners making more errors in the longer sentences. The results show that the differences between the L2-higher and the L2-lower group were much smaller than the differences between the L1 and the L2-higher group, as were the effect sizes.

Overall there were very few ‘confused’ errors. The L2-higher group made more confused errors than the L1 group, and the L2-lower group performed worst. However, even in the L2-lower group, there were relatively few ‘confused’ errors.

In respect of whether listeners made more ‘not heard’ errors or ‘illusory’ errors: in the short sentences, the L1 group made hardly any ‘illusory’ errors but made a larger amount in the longer sentences. L2 listeners in Study 2 make more ‘illusory’ errors than ‘not heard’ in the short sentences. However, in the longer sentences, there was no real difference in the percentages of errors made within each category of error types.

Table 10. The difference between the % of ‘not heard’ errors and the % of ‘illusory errors’. + = more ‘illusory’ errors; - = fewer ‘illusory’ errors.

	L1 group	L2 group (whole group)	L2-higher group	L2-lower group
Short sentences				
	- 0.5 ^{ns}	+ 10.0 ***	+ 6.8 *	+ 12.0 ***
	SD = 6.02	SD = 18.67	SD = 12.66	SD = 21.51
	SEM = .98	SEM = 2.32	SEM = 2.53	SEM = 3.40
	d = 0.08	d = 0.53	d = 0.54	d = 0.56
Longer sentences				
	+ 4.1 *	+ 1.6 ^{ns}	+ 4.2 ^{ns}	- 0.1 ^{ns}
	SD = 10.19	SD = 24.89	SD = 21.20	SD = 27.07
	SEM = 1.65	SEM = 3.09	SEM = 4.24	SEM = 4.30
	d = 0.40	d = 0.06	d = 0.20	d = 0.004

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} p > .05.

To investigate whether overall performance in accuracy on the shorter and longer sentences was correlated for individuals, we ran a Spearman’s rho test for correlation in SPSS version 25. This showed that performance was strongly correlated for individuals across the L2 group, although the correlation was weaker for the higher level group L2-

higher group than the lower level L2-lower group. Performance was only very weakly correlated for the L1 listeners.

- For L1 listeners, the correlation coefficient r was .157, $p = .345$
- For the L2 listeners (whole group, $N = 65$), $r = .728$, $p = .000$
- For the L2-higher listeners ($N = 25$), $r = .511$, $p = .009$
- For the L2-lower listeners ($N = 40$), $r = .766$, $p = .000$.

This would again suggest that errors made by L1 listeners were random. However, L2 listeners who made errors with the short sentences were more likely also to make errors with the long sentences.

We further tested whether the more salient reduced auxiliary verb presented as a separate syllable (articulated as /əv/) as the enclitic to modal verbs (e.g. *would've*) would be more easily identified than the less salient pronoun enclitic (articulated as /v/ - e.g. *they've*), and whether the modal verb clitic would be confused less than the pronoun clitic. The percentages of errors for each category are shown in Tables 11 and 12.

Table 11. Percentage of 'not heard' errors in each of the two categories: pronoun clitics versus modal verb clitics; and percentage of confused clitics in each of the two clitic categories (where the clitic is heard but identified incorrectly as a pronoun clitic or as a modal verb clitic).

Group	Short sent. with clitic on pronoun	Short sent. with clitic on modal	Long sent. with clitic on pronoun	Long sent. with clitic on modal	Short sent. with clitic on pronoun	Short sent. with clitic on modal	Long sent. with clitic on pronoun	Long sent. with clitic on modal
	<i>clitic not heard on pronouns</i>	<i>clitic not heard on modals</i>	<i>clitic not heard on pronouns</i>	<i>clitic not heard on modals</i>	<i>Confused : - 've heard but identified on modal</i>	<i>Confused : - 've heard but identified on pronoun</i>	<i>Confused : - 've heard but identified on modal</i>	<i>Confused : - 've heard but identified on pronoun</i>
L1	3.16	0.00	5.00	1.05	0.00	0.53	0.26	0.53
L2	15.2	10.9	30.0	18.3	0.92	8.6	6.2	8.9
L2-higher	10.8	7.6	26.4	10.0	0.4	5.6	2.8	6.0
L2-lower	18.0	13.0	32.3	23.5	1.3	10.5	8.3	10.8

Table 12. Differences within group between percentage of 'not heard' errors made in the pronoun enclitic 've category versus the modal verb enclitic 've category; and differences within group between errors made confusing a pronoun clitic as a modal verb clitic and vice versa. Differences are shown together with standard deviation, standard errors of the mean and effect sizes.)

Group	Short sent. 'Not heards' - Diff between pronouns and modals	Long sent. 'Not heards' - Diff between pronouns and modals	Short sent. 'Confused' - Diff between pronouns and modals	Long sent. 'Confused' - Diff between pronouns and modals
L1	3.16*** SD = 5.26 SEM = .85 d = 0.60	3.9** SD = 8.23 SEM = 1.34 d = 0.47	0.53 ^{ns} SD = 2.26 SEM = .34 d = 0.23	0.27 ^{ns} SD = 2.83 SEM = .46 d = 0.10
L2	4.3* SD = 16.77 SEM = 2.08 d = 0.26	11.7*** SD = 24.47 SEM = 3.03 d = 0.48	7.7*** SD = 14.55 SEM = 1.80 d = 0.53	2.7 ^{ns} SD = 12.06 SEM = 1.50 d = 0.22
L2-higher	3.2 ^{ns} SD = 16.00 SEM = 3.20 d = 0.20	16.4** SD = 23.96 SEM = 4.79 d = 0.68	5.2* SD = 10.05 SEM = 2.01 d = 0.52	3.2 ^{ns} SD = 10.30 SEM = 2.06 d = 0.31
L2-lower	5.0 ^{ns} SD = 17.39 SEM = 2.75 d = 0.29	8.8* SD = 24.61 SEM = 3.89 d = 0.36	9.2*** SD = 16.70 SEM = 2.54 d = 0.55	2.5 ^{ns} SD = 13.16 SEM = 2.08 d = 0.19

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} p > .05.

L1 Listeners: differences between errors made in not hearing pronoun clitics versus not hearing modal verb clitics in both the long and the short sentences was significant and effect sizes were medium, which indicates a saliency effect.

L2 listeners: L2 listeners performed worse than L1 listeners, with the L2-lower average being poorer than the L2-higher. However, the pattern of the differences was the same across both L2 groups: in the short sentences, we did not find a saliency effect; in the longer sentences, there were significantly fewer errors for the more salient modal clitics than for the less salient pronoun clitics, and the effect size was moderate for the L2-higher

group albeit small-moderate for the L2-lower group, indicating a possible salience effect for the higher level L2 listeners in the longer sentences.

In respect of confusion between whether the reduced auxiliary (-*ve*) was encliticised to a pronoun or to a modal verb:

L1 listeners made almost no errors; L2 listeners in both groups made more errors with modal verb clitics by identifying these as being pronoun clitics. They made fewer ‘confused’ errors when presented with pronoun clitics – that is, they did not attribute the clitic attached to a pronoun to being attached to a modal verb. However, the differences were only found to be significant and with a medium effect size for the short sentences and not for the long sentences.

2.4 Study 3 – derivational morphemes suffixes

2.4.i. *Aim*

To test L2 listeners’ abilities to recognise suffixed derived morphemes denoting word class.

2.4.ii. *Method*

Participants

Following a ten-minute break, the 103 participants from Studies 1 and 2 also took part in this study.

Materials and test design

Test materials for this study also comprised recordings of sentences and a paper-based response booklet. In addition, there was a sheet asking participants whether they were familiar with the words that were presented in the study.

In total there were 50 individual sentences, each with a different meaning and each between 15 – 18 words in length, spoken by an adult female L1 English speaker with a standard accent from the southeast of England. Participants were expected to listen to the recordings and identify the final functional morpheme of one of the words in each sentence, distributed as follows: a noun – 15 items, an adjective – 15 items, or an adverb – 20 items. The root of the relevant word was written in the test booklet and also spoken by the speaker in the recordings before the sentence was spoken. This allowed the participants to both read and hear the root word before listening to the whole sentence. For example, if the participants were required to recognise, and write, the final morpheme of the word *arrangement*, they heard and read the root of the word *arrange*_____. In this way, participants were primed on the relevant word but did not know where in the sentence it would occur nor what the word class would be. It should be noted that sentences in this experiment included syntactic cues on word class.

Examples of sentences:

- *The university's leaders and managers wanted to be sure that **educational** standards were as high as possible.*
- *When you travel in another country, things can be very different **cultural**ly from your home country.*
- *We hoped that we had **satisfactorily** completed the questionnaire for our visa application.*
- *The Professor's lectures were so interesting that **attendance** amongst the students was always one hundred per cent.*

For these four sentences, the root word in the test booklet were: *educate, culture, satisfy, attend.*

The test booklet included written instructions.

As familiarity with words can influence speed of processing, we asked the participants to complete a word-familiarity sheet with the relevant words in the form in which the words were spoken in the sentences. The sheet was given to participants after they had finished recording their responses. As expected, even the participants with the weakest levels of English were familiar with all but very few of the words.

Procedure

Participants read the instructions and examples, after which these were explained orally by the experimenter. Understanding was checked. Following that, participants listened to the examples they had just read to familiarise themselves with the speaker's voice and for procedure to be demonstrated. Participants were informed that spelling errors were not important (i.e. whether they wrote *attend ance* or *attend ence* or even *attend ens*) provided it was clear that they had heard the relevant ending.

Sentences were played once only. Participants recorded their responses in the booklet while listening to the sentences.

2.4.iii. *Analyses and results*

Results show that L1 listeners made very few errors in this task.

Fifty-two of the 65 L2 listeners completed the word familiarity sheet – this included all 40 lower level L2 listeners and 12 of the higher level L2. As discussed previously in Chapter 1, there is some evidence that listeners recognise words more easily and more quickly the more familiar the words are. However, when cross-referencing the word familiarity sheet with the results, we found no substantive evidence that lack of familiarity with a word

interfered with recognition of derivational endings. Words that listeners said they did not know were often written out with accuracy, while the endings of words that listeners said they knew well were amongst those that were misrecognised. There was no particular pattern linking errors to words that participants said were not known to them. For instance, only two participants said they were not familiar with the word *motivational*'. Yet, one of the two recognised the word ending correctly, whereas the other did not. All of the remaining 50 participants who completed the word-familiarity sheet said they were familiar with the word, yet 29 of them did not recognise the word ending correctly in the task. 22 participants said they were not familiar with the word *alliance* – of these 22, 16 recognised the word correctly when listening and only seven of the 22 made errors. Three of the participants who said they were familiar with the word did not recognise it correctly. Since 52 participants completed the form and there were 50 word items, there were 2,600 word items that were cross-referenced with the familiarity sheets.

Of these 2,600 items: 2,148 were recognised correctly, 452 were recognised incorrectly.

In total, the 52 participants reported not knowing 226 of the word items. Of the 226 unknown words, only 64 were recognised incorrectly and 162 were recognised correctly.

Thus the 52 participants reported knowing and being familiar with 2,374 of the word items, of which 388 were not accurately recognised in their full form. (452 errors in total of which only 64 were reported as unknown = 388 errors among known items.)

Overall levels of accuracy for the study are shown below in Tables 13 – 15:

Table 13. Overall accuracy (in %) in recognising derived morpheme endings, and % of errors out of total trials for each word class category. Group means of accuracy shown in %. Shown with standard deviation and standard errors of the mean.

Group	Accuracy overall	% errors Nouns (out of 15)	% errors Adjectives (out of 15)	% errors Adverbs (out of 20)
L1	99.0	0.007	0.002	0.017
	SD = 1.84 SEM = .30	SD = .02 SEM = .004	SD = .01 SEM = .002	SD = .044 SEM = .007
L2	83.3	0.11	0.17	0.21
	SD = 9.53 SEM = 1.18	SD = .08 SEM = .01	SD = .14 SEM = .02	SD = .14 SEM = .02
L2-higher	88.5	0.09	0.12	0.14
	SD = 8.15 SEM = 1.63	SD = .08 SEM = .02	SD = .11 SEM = .02	SD = .11 SEM = .02
L2-lower	80.1	0.12	0.20	0.26
	SD = 8.95 SEM = 1.42	SD = .07 SEM = .01	SD = .14 SEM = .14	SD = .14 SEM = .02

Table 14. Mean differences between the groups shown in %, shown with SEM and Cohen's d effect size.

Group	Accuracy overall	% errors Nouns	% errors Adjectives	% errors Adverbs
L1 - L2	15.7***	0.01***	0.165***	0.2***
	SEM = 1.57 d = 2.29	SEM = .01 d = 1.77	SEM = .02 d = 1.69	SEM = .02 d = 1.86
L1 - L2-higher	10.5***	0.08***	0.11***	0.12***
	SEM = 1.65 d = 1.78	SEM = .02 d = 1.42	SEM = .02 d = 1.51	SEM = .02 d = 1.46
L2-higher – L2-lower	8.4***	0.03 ^{ns}	0.085*	0.125***
	SEM = 2.16 d = 0.98	SEM = .02 d = 0.40	SEM = .03 d = 0.64	SEM = .03 d = 0.95

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} p > .05.

L1 listeners responded with almost complete accuracy. The L2 listeners made more errors than the L1 listeners, with the L2-lower group performing worse *on average* than the L2-higher group. However, as in the previous two studies, the difference between the two L2 groups was smaller than the difference between the L2-higher group and the L1 group, apart from in the adjective category where the mean difference between the L1 and the L2-higher groups was the same as the mean difference between the L2-higher and L2-lower groups although the effect size was smaller for the latter.

Differences between the amount of errors in each of the three categories - nouns, adjectives and adverbs – showed the following:

- L1 listeners: of the very few errors made, L1 listeners made fewest errors with adjectives and most with adverbs. Although there was a small effect size between the three categories, there was only a significant difference ($p = .048$) between adjectives and adverbs.
- L2 listeners: for all L2 listeners, the mean level of error rate was lowest for nouns and highest for adverbs.
- For the L2 group as a whole, the differences between the three categories were significant, effect sizes were small for the differences between nouns and adjectives and between adjectives and adverbs, but the effect size was medium ($d = 0.76$) for the difference between nouns and adverbs. The results for the whole L2 group appear to reflect the results for the L2-lower group.
- L2-higher listeners: although a similar pattern of differences could be seen for the L2-higher group as for all the L2 groups, these differences were not found to be significant.

Table 15. Significance and effect size for differences between errors made in each word class category.

Group	Nouns - adjectives		Nouns - adverbs		Adjectives - adverbs	
L1	ns;	d = 0.22	ns;	d = 0.20	p = .05;	d = 0.33
L2	p ≤ .001;	d = 0.45	p ≤ .001;	d = 0.76	p = .018;	d = 0.30
L2-higher	ns;	d = 0.21	ns;	d = 0.39	ns;	d = 0.17
L2-lower	p ≤ .001;	d = 0.59	p ≤ .001;	d = 1.02	p = .018;	d = 0.37

ns = not significant. d = effect size.

Where L2 listeners made errors in relation to nouns, these were mainly reports of hearing adjective endings (e.g. *excellent* instead of *excellence*) or of a different noun (*attendant* instead of *attendance*).

L2 listeners' errors with adjectives and adverbs included: adjectives reported as nouns (e.g. *satisfaction* instead of *satisfactory*, *motivation* instead of *motivational*); adverbs reported as adjectives by omitting the *-ly* (e.g. *excellent* instead of *excellently*), or as nouns (e.g. *organisation* instead of *organisationally*); reporting an adverb but misidentifying a morpheme within it (e.g., *worryingly* instead of *worriedly*, *surprisedly* instead of *surprisingly*, *collaborately* instead of *collaboratively*, *organisely* instead of *organisationally*).

2.5 Correlations between accuracy in performance of L2 listeners in Studies 1 - 3 and level of English and between accuracy in performance and time spent in the UK.

In Studies 1 – 3 we divided the L2 listeners into two groups for analysis purposes according to their level of English – those who we could assume had reached the required English language entry level for UK University courses, and those who were still developing their English in preparation to start their courses. In all three studies, the L2-higher group

performed better on average than the L2-lower group, although for individual types of errors, the differences between the two L2 groups were not always significant. Moreover, effect sizes were often medium or small. However, given the range of answers (as shown by the means of the standard errors), we decided to run analyses on correlations for all L2 listeners between, a) accuracy in performance and English language levels (measured by IELTS equivalences), and b) between accuracy in performance and length of time spent in the UK exposed to the target language. The analyses were run in SPSS, version 24, using Spearman rho's non-parametric test of correlation. The results are shown in Tables 16 and 17.

Table 16. a) Correlation between accuracy in performance and L2 English language level. N = 65.

	Past tense, Short sent.	Past tense, Long sent.	Aux. verb clitics, short sent.	Aux. verb clitics, long sent.	Noun, adj. and adverb endings
English language level	.431***	.390***	.375**	.468***	.530***

***Correlation is significant at the .001 level (2-tailed). **Correlation is significant at the .01 level (2-tailed).

Table 17. b) Correlation between accuracy in performance and length of stay in the UK. N = 65.

	Past tense, Short sent.	Past tense, Long sent.	Aux. verb clitics, short sent.	Aux. verb clitics, long sent.	Noun, adj. and adverb endings
Months spent in the UK	.279*	.287*	.273*	.300*	.285*

*Correlation is significant at the .05 level (2-tailed)

The results in Table 16 show a moderate positive correlation between L2 listeners' levels of English and their ability to recognise the functional morphemes with accuracy. The results in Table 17 show a weaker positive correlation between levels of accuracy and length of stay in the UK.

2.6 Study 4 – inflectional morpheme suffixes

2.6.i. Aim

Study 4 was designed as a follow-on from Study 1 to further test suffixed inflected morphemes and particularly to investigate further the voiced-voiceless phoneme contrasts. The aim was to investigate the following with a different pool of L2 participants and a more controlled set of test items:

- a) Differences between L2 listeners' abilities to recognise the /d/ and the /t/ articulations of suffixed inflected past tense verb endings.

As discussed previously, the regular past tense *-ed* verb ending can be articulated in three ways: the voiced /d/ which follows a voiced final phoneme of a verb (e.g. *bagged*); the unvoiced /t/ which follows an unvoiced final phoneme of a verb (e.g. *backed*); and the separate syllable /ɪd/ which follows a verb final /d/ or /t/ sound (e.g. *batted*). In study 1, it was found that L2 listeners made significantly fewer errors when the inflected morpheme was articulated as the separate syllable /ɪd/. It was more difficult for L2 listeners to recognise the *-ed* ending when it was articulated as /d/ and /t/ than as /ɪd/. However, we did find that there were significantly more errors recognising the /t/ than the /d/ when the sentences were short, but this finding was reversed when the sentences lengths were increased. We were interested in voiced – voiceless difference in a more controlled context.

- b) The ratio between 'not heard' errors and illusory errors in relation to the voiced /d/ and voiceless /t/ articulations of past tense verb endings.

We investigated the percentages of 'not heard' errors and compared these with the percentages of 'illusory' errors in Study 1. Percentages were

calculated for the ‘not heard’ errors out of total trials in which the verb was presented in the past tense, and percentages for the ‘illusory’ errors were out of how many trials there were with present tense verbs. However, in Study 1 we did not control the final morpheme of the present tense verbs and therefore do not know whether the verb ending influenced whether or not an illusory past tense ending was ‘heard’. In Study 4, the aim was to investigate whether L2 listeners found it more difficult to recognise verb endings that followed a voiced or an unvoiced verb final sound.

- c) Correlations between recognising inflected past tense verb endings and the inflected plural -s on nouns.
- d) Correlations between performance and IELTS scores and between performance and length of time in the country of the target language (the UK).

2.6.ii. *Method*

Participants

The twenty-four participants in Study 4 were also undergraduate and postgraduate students studying at the same two UK universities in the south-east of England as the participants in Studies 1 – 3, but they were different from the participants in the previous studies. All participants were L2 speakers of English, whose nationalities comprised Brazilian (L1 = Portuguese), Chinese, German, Greek, Indian (L1 = Hindi), Iranian (L1 = Persian), Italian, Japanese, Jordanian (L1 = Arabic), Korean, Thai and Vietnamese. As in the other studies, all participants volunteered to take part and were either awarded candies or course credits depending on their programme of study.

The information about first languages, language scores, time spent in the UK, age groups, and gender were obtained from a language-profile form attached to the front of the test booklets. We have previously discussed the difficulty in ascertaining exact English language levels; however, in this study we have approximate recent measurements for participants. The majority of the participants were three quarters of the way through their pre-session course; thus we were able to take the scores of their IELTS tests given when starting their pre-session courses and add a half IELTS point to these, since this was in line with pre-session course expectations. Of the participants who had already started their degree programmes, we had very recent school-leaving English test scores which we translated into IELTS equivalents. The final participant had a recent IELTS scores of 8.0. These measurements are presented as IELTS equivalences.

Table 18. The 24 participants who took part in Study 4.

English as L1 or L2	First languages	Age groups	Gender	Stage of study	Time in the UK	English levels for L2 participants in IELTS equivalences
L2 N = 24	Arabic x 1	18-21 x 11 (f = 10)	female x 20	undergraduate x 5	2 – 4 months x 22	6.0 x 10
	Chinese x 7					6.5 x 8
	German x 3	22-25 x 11 (f = 9)	male x 4	pre-sessional for undergrad study x 9	1.5 years x 1 2 years x 1	7.0 x 5
	Greek x 2					8.0 x 1
	Hindi x 1					mean = 6.45
	Italian x 1					
	Japanese x 1	26-35 x 1 (f)		pre-sessional for master's study x 9		
	Korean x 1					
	Persian x 1	36-55 x 1 (m)		pre-sessional for Ph.D. study x 1		
	Portuguese x 1					
	Thai x 4					
	Vietnamese x 1					

Materials and test design

Test materials:

Test materials comprised recordings of 80 sentences spoken by an adult female L1 English speaker with a fairly standard accent. The sentences were divided into three sections:

Section 1 comprised 40 sentences which contained regular verbs presented in either the past tense or the present tense to investigate listeners' abilities to recognise the regular past tense *-ed* inflected morpheme. The final verb sound was either the voiced /v/ or the voiceless /f/. The /v/ and the /f/ endings were presented in equal numbers for the items which included the past tense. The endings were also presented equally for the present tense items.

Section 2 comprised 20 sentences which contained regular nouns presented in either the singular or with a plural *-s* to investigate listeners' abilities to recognise the regular plural *-s* inflected morpheme. The aim was to investigate whether there was a correlation between the L2 listeners' abilities to accurately recognise the past tense inflected *-ed* morpheme and the plural *-s* inflected morpheme. We used nouns whose final sound was either voiced or voiceless, followed by a vowel sound in the initial position of the following word. Thus the *-s* would be articulated as /z/ after the voiced noun final sound and /s/ after the unvoiced sound. The distribution of the voiced and unvoiced noun final sounds was also in equal numbers. Just as we did not include the separate syllable articulation of the past tense inflected morpheme (e.g. *batted*), we did not either include any examples of *-s* where it was articulated as a separate syllable /ɪz/ (e.g. *wishes, watches, losses*).

Section 3 comprised 20 sentences which contained regular nouns with a plural *-s* inflection. In 10 of the sentences, the *-s* was voiced, thus articulated as /z/, and in

the other 10 sentences, the -s was voiceless and articulated as /s/. This was to investigate whether listeners could recognise the difference between the two articulations of -s.

The format of this study was different from the previous three studies. In Studies 1 – 3, we presented listeners with a variety of different sentences as each sentence, and each sentence context, was different from the others in the study. Participants did not know what the sentence would be prior to hearing it. In contrast, in Study 4, we presented listeners with limited sentence contexts, by repeating only a few sentences several times each.

In each section, the sentence contexts remained limited to 1 or 2 different sentence pairs, with the sentences being repeated a number of times. Participants were told at the beginning of each section what the sentences were. Participants therefore knew what sentence contexts to expect and that they only needed to listen for the presence of a particular functional morpheme – either a past tense verb ending (Section 1) or a plural -s (Sections 2 and 3).

The aim with this format was to reduce the amount of sentence processing (grammar, vocabulary and meaning) and thereby cognitive load, so that listeners were able to focus on recognising the relevant sounds (Sections 1 and 2) or discriminating between the relevant sounds (Section 3). Although the sounds represent tense (time) or plurality versus singularity, this experiment focused only on whether listeners were able to recognise the sounds rather than to understand any associated meaning.

In Sections 1 and 2, we also introduced the use of nonsense (nonce) words. Nonce words are made up words (e.g. Reynolds, 2015), also referred to as pseudowords – that is, pronounceable nonwords with legal sound and syllable clusters (e.g. Ozubko & Joordans,

2011). Keuleers & Brysbaert (2010) point out there is a general agreement that pseudowords should be nonwords that conform to both the orthographic and phonological patterns of the language, since they play a useful role in psycholinguistic experiments, for instance in lexical decision tasks, nonword reading tasks and nonce-inflection tasks. Nonce words have also been used in other kinds of tasks, such as that of Lee (2016), who used nonce words to compare L1 English listeners with L2 English listeners' in an L1 phonological constraint experiment. Thus, there is a tradition for using nonce words in psycholinguistic experiments related to investigating aspects of processing effects and aspects of vocabulary acquisition. In Study 4 we had two particular reasons for choosing nonce words. Firstly, it allowed us to create minimal pairs of words wherein only the final consonant varied between a voiced and a voiceless sound, giving us the opportunity to investigate whether participants processed inflections more easily if the inflection was voiced or voiceless. Secondly, we wanted to simplify semantic context as much as possible to avoid semantic distractions. Whilst there is no one clear understanding of the effect of nonce words, there are suggestions that nonce words have impoverished semantics compared with real words, and there is a lower level of response to them because they have no specific meaning (Ozubko & Joordens, 2011). Ozubko and Joordens further suggest that the lack of semantic distinctiveness could lead to similar sounding nonce words being attributed with more similarity than real words would be. Since the sentences in this study were simple, and the participants were made aware of them in advance, we anticipated that using nonce words would lead to lower levels of semantic processing, thus allowing the participants more processing resources to focus on the recognition of the inflected morphemes. In this way our study was in line with that of Shafer, Kessler, Schwartz, Morr and Kurtzberg (2005), who asked adult participants to listen to sentences with real words and sentences with nonce words and to identify the function word *the* and to recognise whether the words following *the* had semantic meaning or not. Shafer et al. found that participants were able to complete the task accurately whether the item included nonce words or real words.

Section 1 – inflected past tense verb endings

The design of Section 1 relied on using a minimal pair of regular verbs, whose final consonant was either voiced or voiceless, as a voiced final consonant would be followed by the voiced articulation of the regular past tense inflected ending /d/, and a voiceless final consonant would be followed by the unvoiced articulation /t/.

To find a usable minimal pair of regular verbs, we decided to use nonsense nonce words for the verbs. Two sets of nonce minimal pair verbs were created: *vuvv* and *vuff*, and *kevv* and *keff*, where the only difference between the two verbs in each was the voiceless /f/ or the voiced /v/. The verbs were placed in sentences, with each of the two sets of verbs being presented 20 times. Thus, each version of the verbs (voiced or voiceless) was presented in half the 20 trials. The sentence with *vuvv/vuff* contained 11 syllables, the sentence with *kevv/keff* contained 9 syllables.

The two sentences:

10 trials with voiced /v/:	<i>I quite often vuvv only one before class.</i> <i>I quite often vuvved only one before class.</i>	(present tense x 4) (past tense x 6)
10 trials with voiceless /f/:	<i>I quite often vuff only one before class.</i> <i>I quite often vuffed only one before class.</i>	(present tense x 4) (past tense x 6)
10 trials with voiced /v/:	<i>The boys sometimes kevv another one.</i> <i>The boys sometimes kevvved another one.</i>	(present tense x 4) (past tense x 6)
10 trials with voiceless /f/:	<i>The boys sometimes keff another one.</i> <i>The boys sometimes keffed another one.</i>	(present tense x 4) (past tense x 6)

Of the total 40 sentences, 24 were thus presented with verbs in the past tense (12 each of the voiced and unvoiced endings) and 16 sentences were presented with verbs in the present tense (8 each with the voiced and unvoiced final phonemes) as outlined above. The order of the sentences was randomised before they were recorded. Participants were asked to note in the response booklet whether the sentence was in the present tense (without the regular past tense ending) or in the past tense (with the past tense ending).

Section 2 – inflected plural -s noun endings

In section 2, the design also relied on using minimal pairs - this time nouns – whose final consonant was either voiced or voiceless. For this section, the chosen noun was *lod* with the voiced final consonant /d/ and *lot* with unvoiced final consonant /t/. *Lod* is a nonce word, and while *lot* is a real noun, L2 listeners are more likely to be familiar with the word *lot* used in the phrase *a lot of* or *lots of* as a determiner rather than as a noun. It was therefore considered that *lot* could be treated similarly to *lod* as a nonce word for the purposes of this study. Each sentence contained nine syllables and the two words *lod* and *lot* were presented equally, as follows:

The sentence:

10 trials with voiced /d/:	<i>I have the funny lod in my room.</i>	(singular x 4)
	<i>I have the funny lods in my room.</i>	(plural x 6)
10 trials with voiceless /t/:	<i>I have the funny lot in my room.</i>	(singular x 4)
	<i>I have the funny lots in my room.</i>	(plural x 6)

As in Section 1, the order of the sentences was randomised before they were recorded. Participants were asked to note in the response booklet only whether they heard the singular or the plural, that is whether or not they heard the -s.

Section 3 - /s/ or /z/

This section investigated whether listeners could recognise whether the -s sound was voiced or voiceless, /s/ or /z/. There were four sentences, each repeated five times in a randomised order. In two of the sentences, the noun was pronounced with a voiceless /s/ sound, in the other two sentences, the noun included a voiced /z/ sound. Each sentence contained nine syllables.

The sentences were:

With /s/:	<i>I heard about the place over there.</i>	(voiceless x 5)
With /z/:	<i>I heard about the plays over there.</i>	(voiced x 5)
With /s/:	<i>She thought about the rice over there.</i>	(voiceless x 5)
With /z/:	<i>She thought about the rise over there.</i>	(voiced x 5)

The order of the sentences was randomised. This section was included to further investigate whether there might be issues of voiced/voiceless discrimination, and participants were asked to note in the response booklet which of the sentences they heard – that is whether they heard *place* and *rice* with the /s/ sound or whether they heard *plays* or *rise* with the /z/ sound.

Response booklets

Each participant was provided with a paper copy of a response booklet. Instructions and examples were given at the beginning of each section. Following the instructions and examples, the item numbers were written in the booklet, next to which the participants could write their responses. In Section 1, participants were asked to write **/** if they heard the verb in the present tense (without the inflected ending), and **ed** if they heard the verb in the past tense (with the inflected -ed ending). In Section 2, they were asked to respond with **/** for the singular (= no -s), and **S** if they heard the plural -s. In Section 3, participants were asked to write **S** for the /s/ articulation and **Z** for the /z/ articulation. Participants were asked to distinguish clearly between their handwritten **S** and their **Z** to avoid scribbled letters being misidentified.

Procedure

The first nineteen participants were tested as one group, and the other five were tested individually depending on availability. The same experimenter conducted all the test sessions to ensure consistency. We acknowledge that there was a possible risk of participants' performances varying depending on whether they were tested individually or in a group. Therefore, when participants were tested on their own, the experimenter sat at a distance so the participants would not feel their responses were being monitored and therefore would not feel unnecessary performance anxiety. (The results showed that the participants who were tested individually had mixed results in Section 1, as did the people tested in the group. In Section 2, the individually-tested participants made no errors at all, thus performing much better in Section 2 than in Section 1; similarly, the group-tested participants performed much better overall in Section 2 than in Section 1. There was therefore no clear indication in this study of the differences in the test situations being an issue, although we cannot rule that out.)

Before listening to each test section, participants had time to read written instructions and examples, after which the experimenter explained instructions orally and checked understanding. Following that, the participants listened to the examples they had just read in the test booklet for familiarisation with the speaker's voice as well as for demonstration of procedure. The fact that the verb had no lexical meaning was explained.

Participants then listened to the recorded sentences (items) and marked their responses down in the booklet. The item number was said before the item was spoken to ensure that listeners put their responses in the correct places. Listening to recordings rather than listening to a speaker speaking 'live' ensured consistency of items across test sessions.

As in Studies 1 - 3, participants were asked to write their responses immediately after they had heard the sentence, or as soon as they had identified the presence or absence of the relevant morpheme.

The items were played once only. As in the other studies, participants were asked to write a response for each item even if they were in doubt about what they had heard.

Participants were not put under time pressure. Small pauses of 10 - 15 seconds were included after every 10 sentences to avoid lapses in concentration. The aim was to investigate whether participants had the ability to process morpheme endings when listening to simple sentences rather than to see how quickly they could do this.

As can be seen in the sentences presented above, apart from the verbs in Section 1 and the nouns in Section 2, the vocabulary in the sentences was high frequency and the grammar was simple in order to limit cognitive load and distractions.

2.6.iii. *Analyses and results*

Section 1:

i Levels of accuracy and differences between types of errors

As in Study 1, the results showed two types of errors in respect of recognising inflected past tense verb endings: errors of not hearing past tense inflections ('not heards') and errors of hearing past tense inflections when they had not been articulated ('illusory' morphemes). Levels of accuracy and errors are shown in Tables 19 and 20.

Table 19. Mean levels of accuracy and errors shown in % – shown with standard deviation and standard errors of the mean.

Overall level of accuracy	Total 'not heard' past tense errors	Total illusory morpheme errors	Percentage of 'not heard' /d/	Percentage of 'not heard' /t/	Percentage of illusory errors (/d/) on voiced /v/	Percentage of illusory errors (/t/) on voiceless /f/
(out of 40 trials)	(out of 24 trials)	(out of 16 trials)	(out of 12 trials)	(out of 12 trials)	(out of 8 trials)	(out of 8 trials)
74.3	25.2	26.4	23.4	27.1	30.9	21.9
SD = 17.84 SEM = 3.64	SD = 16.32 SEM = 3.33	SD = 24.14 SEM = 4.93	SD = 17.68 SEM = 3.61	SD = 23.60 SEM = 4.82	SD = 32.11 SEM = 6.55	SD = 20.57 SEM = 4.20

Table 19 shows that mean level of accuracy was around 75% overall. Compared to the overall mean level of accuracy in the short sentences for the L2 group in Study 1 at around 80% (79.8%), this result was about five percent lower. Compared to the results in the longer sentences at 68%, it was around six percent higher. (The mean IELTS score equivalence for the L2 Study 1 participants was 6.2, and for the Study 4 participants it was 6.5.)

Compared to the individual L2 groups, L2-higher and L2-lower, the Study 4 mean level of accuracy was a little lower than that of the L2-lower group in the short sentences (3% lower), but 1% higher than the L2-higher group in the long sentences.

Although not exactly the same, the results from the two studies were in the same region. It is worth noting, that Study 4 did not include the perceptually more salient past tense ending articulated as the separate syllable /ɪd/. The results of the participants in Study 1 were more accurate in the separate syllable /ɪd/ trials. Had Study 4 included the separate syllable past tense ending, it is possible we might have seen a slightly higher mean accuracy result for the participants in Study 4.

The difference between the percentage of ‘not heard’ errors to ‘illusory’ errors was calculated on the percentage of errors made out of the total trials in each category. As such, the percentage of ‘not heard’ was out of 24 trials, and the percentage of ‘illusions’ was out of 16 trials. An analysis using a t-test for repeated measures was conducted in SPSS version 25 to verify the significance of the differences. A Cohen’s D test was run to find the effect sizes.

Table 20. Mean differences between percentages of ‘not heard’ errors and ‘illusory’ errors and between percentages of voiced and voiceless errors. Shown with standard deviation, standard errors of the mean, and effect sizes (d).

Difference between ‘not heard’ <i>-ed</i> errors and illusory <i>-ed</i> errors	Difference between ‘not heard’ /d/ and /t/	Difference between illusory <i>-ed</i> errors on /v/ and /f/
1.2 ^{ns}	3.7 ^{ns}	9.0 ^{ns}
SD = 17.62 SEM = 3.60 d = 0.07	SD = 26.01 SEM = 5.31 d = 0.14	SD = 24.04 SEM = 4.91 d = 0.37

^{ns} p > .05

As seen in table 18, the mean differences were very small between:

- ‘not heard’ errors and illusory errors
- ‘not heard’ /d/ and /t/ errors

but larger at 9.0% for the:

- ‘illusory’ /d/ and /t/ phonemes following the verb voiced final sounds (/v/) and unvoiced final sounds (/f/).

However, none of the differences were found to be significant. Effect sizes for the first two differences were negligible, although there was a very small effect size for the differences between the two illusory phoneme categories.

ii *Correlations between accuracy in performance and level of English and between accuracy in performance and time spent in the UK*

Finally, a Spearman rho's non-parametric analysis was conducted in SPSS (version 25) for correlations between, a) English language level (measured by IELTS equivalences) across all 40 items and accuracy in performance, and b) length of time spent in the UK (that is, exposure to the target language, measured through number of weeks spent in the UK) across all 40 items and accuracy in performance. The results show a negative and non-significant weak correlation between level of English and accuracy, and no correlation between length of time in the UK and accuracy:

Level of English language and accuracy: $r = -.226$; $p = .289$.

Length of time in the UK and accuracy: $r = -.024$; $p = .911$.

The negative correlation may be attributed to the fact that some of the higher language level participants made a higher proportion of errors than some of the slightly lower level participants.

Section 2:

The results were analysed in SPSS version 25, and showed that the mean level of accuracy in recognising the inflected plural *-s* was very high. As the aim was to investigate whether L2 listeners had similar issues recognising the inflected plural *-s* morpheme on nouns as they had with recognising the inflected past tense *-ed* ending on regular verbs, the results from Section 2 were therefore compared with the results from Section 1 of the study. The analysis showed that there was a mean difference between overall performance of around 20 % between past tense ending recognition and plural ending recognition. This difference was significant ($p \leq .001$) and the effect size was large ($d > 0.8$). Moreover, there was no correlation between listeners' error rates in Section 1 and Section 2.

Table 21: Comparisons and correlations between levels of accuracy in past tense verb endings and plural -s. Shown with standard deviations and standard errors of the mean.

Accuracy: past tense inflected morphemes	Accuracy: plural -s inflected morphemes	Mean difference between accuracy in past tenses & plurals	Correlation between accuracy with past tenses and with plurals
74.3	94.0	19.7 ***	.126 ^{ns}
SD = 17.84 SEM = 3.64	SD = 7.07 SEM = 1.44	SD = 19.92 SEM = 4.07 d = 0.99	

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} p > .05.

Mean errors rates for the four different types of error were:

- 'not heard' -s after /d/ = 3.13%
- 'not heard' -s after /t/ = 1.98%
- 'illusory' -s after /d/ = 0.00%
- 'illusory' -s after /t/ = 2.71%

The mean differences between the different types of error are given in table 22.

Table 22. Mean differences between percentages of 'not heard' errors and 'illusory' errors and between percentages of voiced and voiceless errors in respect of inflected -s. Shown with standard deviation, standard errors of the mean, and effect sizes (d).

Difference between 'not heard' -s errors and illusory -s errors	Difference between 'not heard' -s following /d/ and following /t/	Difference between illusory -s errors following /d/ and following /t/
3.2 ^{ns}	1.15 ^{ns}	2.7 **
SD = 7.80 SEM = 1.59 d = 0.41	SD = 4.04 SEM = 0.82 d = 0.28	SD = 3.90 SEM = 0.80 d = 0.69

**significant at the .01 level. ^{ns} p > .05.

As seen in table 22, the mean differences were very small between:

- 'not heard' errors and illusory errors
- 'not heard' -s following the /d/ and /t/ errors
- 'illusory' -s phonemes following the verb voiced final sounds (/d/) and unvoiced final sounds (/t/).

The first two differences were not found to be significant and effect sizes were low. Only the difference between the two types of illusory phoneme was found to be significant and the effect size was medium. In fact, none of the participants made any illusory errors following the voiced /d/ sound, although some were made following the unvoiced /t/ sound. It is worth bearing in mind though that there were only four trials each of singular nouns ending in /d/ or /t/ in which the illusory morpheme could be erroneously heard.

ii *Correlations between accuracy in performance and level of English and between accuracy in performance and time spent in the UK*

Finally, as in Section 1, a Spearman rho's non-parametric analysis was conducted for correlations between, a) English language level (measured by IELTS equivalences) across all 20 items and accuracy in performance, and b) length of time spent in the UK across all 20 items and accuracy in performance. The results show a positive and significant moderate correlation between language level and accuracy, and a positive but non-significant weak correlation between length of time in the UK and accuracy:

Level of English language and accuracy: $r = .502$; $p = .012$.

Length of time in the UK and accuracy: $r = .253$; $p = .234$.

Section 3:

As mentioned, the first 19 participants were tested together as one group after which their data were analysed. The results for this section show the following:

- 8 of the 19 listeners made no errors identifying whether the -s sound was voiced /z/ or voiceless /s/.
- The other 11 listeners identified the /z/ sound incorrectly as /s/ in some trials but not in all.
- 6 of the 11 also misidentified the /s/ as /z/ in a few trials.

Although 8 of the 19 listeners made no errors, the results from the 19 showed mean levels of accuracy for identifying /s/ correctly as 95.3% and for identifying /z/ correctly as 89.5%.

After looking at the results of the 19 participants, we were not certain that the design of this section of the study would yield anything worthwhile. The question of whether L2 listeners misidentify words because they do not discriminate easily between /s/ and /z/ is interesting, but it should be investigated in its own right rather than in connection with an inflected -s morpheme in the way it was designed in this study. We acknowledge that there could have been an issue in that one of the four items in this section included an inflected plural -s morpheme articulated as /z/ ('plays'), but the other three items included the -s sound as an inherent part of the word ('place', 'rice' and 'rise'). Thus, the /s/ articulation was an inherent part of the word in both /s/ item types, whereas the /z/ articulation was only an inherent part of the word in one /z/ item type, and in the other /z/ item type, the /z/ was an inflected plural morpheme. The processing of the inflected -s morpheme would have been processed differently from the inherent -s sound if the listeners had decomposed the inflected word, especially if the inflected morpheme had been processed through the procedural route claimed by the dual-route hypothesis to underpin grammar processing, rather than being processed by the declarative route

thought to underpin lexical-semantic processing. Moreover, the change in task type in Section 3 from the tasks in Sections 1 and 2 (which only required recognition of the presence or absence of an inflected morpheme) may have added some confusion both in recognising the correct articulation and, also, in recording the -s sounds as either **S** or **Z** in the response booklet. Each of these things may have contributed separately, or together, to the differences in levels of accuracy between the identification of the /s/ sound and the /z/ sound. A decision was therefore taken that this section would not be administered to the subsequent participants who had already signed up for the study. Instead, rather than asking the subsequent participants to complete Section 3, we decided to deploy their time to piloting sections of Study 5.

2.7 Study 5 – reduced auxiliary and modal verb clitics

2.7.i. Aim

The aim with the study was to investigate listeners' abilities to recognise a range of reduced auxiliary verbs in connected speech – both primary auxiliary verbs (in this case *have*, *has* and *had*) and modal auxiliary verbs (*would* and *will*). As in Study 2, the underlying assumption was that reduced auxiliary verbs might be akin to inflectional morphemes and would also be difficult to recognise in connected speech.

The format of this study was different from Studies 1 – 3, but it resembled Study 4 in that listeners were presented with limited sentence contexts, with a few sentences being repeated several times each in order to exert more control over variables. (In Experiments 1 – 3, we presented listeners with a variety of different sentence contexts as each sentence was different from the others.)

2.7.ii. *Method**Participants*

Fifty-nine university students and four post-doctoral members of staff took part. Of the 63 participants, forty were L1 English speakers and twenty-three were L2 speakers of English – the L2 group included the four members of staff. The participants were different from the participants in the previous four studies but came from the same two Higher Education establishments. The minimum English level was high B2 on the CEFR (or the equivalent of IELTS 6.5); the L2 group was therefore not divided for analysis purposes. The L2 participants' L1s were Arabic, Cantonese, Chinese, Czech, Danish, Filipino, German, Greek, Italian, Portuguese, Punjabi, Russian and Spanish. Relevant information about the participants was collected from the language profile form that the participants completed prior to starting the test.

Table 23. The 63 participants who took part in Study 5.

English as L1 or L2	First languages	Age groups	Gender	Stage of study	Time in the UK	English levels for L2 participants in IELTS equivalences
L1 N = 40	English	18-21 x 39 (f = 35) 22-25 x 1 (f)	female x 36 male x 4	undergrad. x 40	n/a	n/a
L2 N = 23	Arabic x 1 Cantonese x 4 Chinese x 1 Czech x 1 Danish x 1 Filipino x 1 French x 1 German x 2 Greek x 3 Italian x 2 Portuguese x 1 Punjabi x 1 Russian x 3 Spanish x 1	18-21 x 15 (f = 11) 22-25 x 3 (f = 2) 26-35 x 1 (f) 36-55 x 3 (f = 1)	female x 16 male x 7	undergrad. x 19 postdoc x 4	mean = 3 years. Length of time ranged mainly from 1 month to 3 years, but 4 people had been in UK for 4 years +.	Language scores ranged from 6.5 – 8.5.

Materials and test design

The materials were in the same format as in the previous studies: recordings of sentences and a paper-based test booklet for responses. The sentences were spoken by an adult, female L1 English speaker with a fairly standard accent from the southeast of England.

The sentences were divided into seven sections of forty sentences. For each section, the sentence contexts remained limited to 1 – 3 different sentences, with the sentences being repeated a number of times in a random order (as in Study 4). Participants were told at the beginning of each section what the sentences were. Participants therefore knew what sentence contexts to expect and knew that they only needed to listen for the presence of a particular functional morpheme – either an auxiliary verb or a modal verb. The aim with this format was to reduce grammatical processing and vocabulary processing (and thereby cognitive load) and to focus simply on whether listeners were able to hear the relevant sounds. Although the relevant morphemes represented meanings, this study focused only on whether the participants recognised the sounds of the morphemes rather than on comprehension of any associated meaning.

The purpose with the seven sections was to test participants' abilities to recognise a range of sounds representing reduced auxiliary verb and modal verbs; namely *-ve*, *-d*, *-ll*, *-s* (– reductions of *have*, *had*, *would*, *will*, *has*). The reduced auxiliary verbs (*have*, *has*, *had*) were encliticized to either pronouns or to modal verbs, but reduced modal verbs (*would*, *will*) were encliticized only to pronouns.

The test booklet included written instructions and examples at the beginning of each section.

Sections 1 – 5 gave participants a binary choice. Did they 'hear' a sound that represented the functional morpheme clitic? It should be noted that this design allowed participants

to say whether they had heard the relevant sound if they heard any kind of sound feature in the relevant position in the sentence, whether they recognised what it was or not. This meant that we would not be able to know whether participants had actually heard what the sound was or whether they had merely perceived some sound. A sixth section was therefore set up in which we were able to investigate listeners' abilities both to perceive the presence of one or two sounds **and** to discriminate between the possible sounds - that is, listeners were asked to say whether they heard a functional morpheme and whether it was *-ve*, *-d*, or *-d've* (i.e. *have*, *had*, or *would have*).

A seventh section was set up to investigate the effect of a nonce verb on morpheme recognition. We were interested to see whether listeners would be distracted by a verb whose meaning they did not know, which rendered the overall meaning of the sentence not comprehensible. It is not uncommon for L2 listeners to listen to sentences which contain content words they do not know. In Section 7, the aim was to see how L2 listeners and L1 listeners performed in such a situation and whether they became distracted from the task. We would investigate this through comparisons with performance in Section 5, which had a real verb, as both Sections 5 and 7 investigated the reduced auxiliary verb *have* encliticised to a modal verb.

The number of times each type of functional morpheme was repeated was varied across sections. This was done to prevent listeners attending to any kind of pattern and building expectations of how many items of each kind of morpheme was going to be presented.

The materials for the seven sections were designed as follows:

Section 1 - 've: The auxiliary verb *have* reduced to *-ve* (signifying the present perfect tense). *-ve* presented as an enclitic to a pronoun followed by an irregular verb. Using the irregular verb meant that the sentences did not include any cues as to which tense (present perfect or past simple) had been presented.

The sentences without the reduced auxiliary were presented 8 times each, and the sentences with the reduced auxiliary were presented twelve times each.

The two sentences with and without the -ve sound:

<i>-I think they put the lights on</i>	x 8
<i>-I think they've put the lights on</i>	x 12
<i>-I hope we left the keys here</i>	x 8
<i>-I hope we've left the keys here</i>	x 12

Section 2 – 'd: The auxiliary verb *had* reduced to -d (signifying the past perfect tense) and the modal verb *would* reduced to -d (signifying modality & polite preference). Both were presented as an enclitic to a pronoun. The lexical verb in the sentence was in the same form whether or not the sentence included the functional morpheme, therefore there were no syntactic sentence cues to aid recognition of the morpheme.

The three sentences with and without the -d sound:

<i>-Of course we only want one</i>	x 10
<i>-Of course we'd only want one</i>	x 10
<i>-I thought I answered all the questions</i>	x 4
<i>-I thought I'd answered all the questions</i>	x 6
<i>-Of course they like tea</i>	x 4
<i>-Of course they'd like tea</i>	x 6

Section 3 – 'll: The modal verb *will* reduced to -ll (signifying the future tense) attached as a clitic ending to a pronoun. Again, there were no syntactic cues to influence morpheme recognition.

The three sentences with and without the -ll sound:

<i>-My mother and I'll help you</i>	x 7
<i>-We'll do it quickly and efficiently</i>	x 7
<i>-It seems we'll have to start again</i>	x 7
<i>-My mother and I help you</i>	x 6
<i>-We do it quickly and efficiently</i>	x 6
<i>-It seems we have to start again</i>	x 7

Section 4 – ‘s: The auxiliary verb *has* reduced to -s (signifying the present perfect tense in the third person singular) as an enclitic to a pronoun. Irregular verbs were used in this section to avoid syntactic cues for morpheme recognition.

The two sentences with and without the -s sound:

- <i>He always put it there</i>	x 8
- He's always put it there	x 12
- <i>Of course he often left early</i>	x 8
-Of course he's often left early	x 12

Section 5 – ‘ve: The auxiliary verb *have* reduced to -ve (signifying possibility in the past versus possibility in the future).

The two sentences with and without the -ve sound:

- <i>I think they could put the lights on</i>	x 9
-I think they could've put the lights on	x 11
- <i>We might hit the wrong button</i>	x 8
-We might've hit the wrong button	x 12

Section 6 – ‘ve, ‘d, or ‘d ‘ve: The auxiliary verb *have* in present and past forms *have* and *had* reduced to -ve and -d, and the modal verb *would* followed by the auxiliary verb *have* reduced to -d -ve. (These functional morphemes signify the present perfect and past perfect tenses, and possibility in the past, respectively.)

This section investigated the ability of participants both to recognise whether a morpheme was (or two morphemes were) present and to discriminate between the different reduced morphemes. Each form of the sentence was presented 10 times, as follows:

<i>-I think they walked there</i>	(past simple)
<i>-I think they've walked there</i>	(present perfect)
<i>-I think they'd walked there</i>	(past perfect)
<i>-I think they'd 've walked there</i>	(possibility/probability in the past)

Section 7 – 've: The auxiliary verb *have* reduced to *-ve* (signifying possibility in the past versus possibility in the future). This section was similar to Section 5 except that the lexical verb in 5 was irregular, here the verb was regular and nonce. The verb was chosen from Study 4.

The two sentences with and without the *-ve* sound:

<i>-It's possible he might keff it quite well</i>	x 8
<i>-It's possible he might've keffed it quite well</i>	x 12
<i>-It's possible he could keff it quite well</i>	x 8
<i>-It's possible he could've keffed it quite well</i>	x 12

Procedure

The procedure for this experiment was similar to the procedure for the other experiments. Participants were tested in groups. They were given written and oral instructions and examples at the beginning of each section, and comprehension of instructions was checked. A response key was printed as a reminder on each page of the response booklet.

Each section took around 2 – 3 minutes to complete with a short pause after the first 20 items in each section and another short pause of a couple of minutes between sections to avoid fatigue. Additionally, participants had a break from concentrating on listening for morphemes while they were familiarising themselves with each section. Participants were asked to give a response to every item and to respond immediately after each item was played.

2.7.iii. Analyses and results

i. Levels of accuracy and differences between the L1 group and the L2 group

The group means for levels of accurate morpheme recognition are shown in Table 24.

Table 24. Mean levels of accuracy and mean differences shown in %. Shown with standard deviation, standard errors of the mean. Mean differences show with Cohen D effect sizes.

Group	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
	Pronoun plus 've	Pronoun plus 'd	Pronoun plus 'll	Pronoun plus 's	Modal verb plus 've	Mixed past tenses and past modals	Modal verb plus 've (+ nonce verb)
	(have)	(would/had)	(will)	(has)	(have)	(they walked, they've walked, they'd walked, they'd 've walked)	(have)
L1	97.3	97.5	98.7	99.4	98.9	98.0	97.9
	SD = 3.94 SEM = .62	SD = 3.20 SEM = .51	SD = 2.33 SEM = .37	SD = 1.47 SEM = .23	SD = 2.52 SEM = .40	SD = 2.61 SEM = .41	SD = 6.60 SEM = 1.04
L2	90.8	92.7	93.9	95.9	94.3	86.5	93.0
	SD = 11.57 SEM = 2.41	SD = 6.07 SEM = 1.27	SD = 8.75 SEM = 1.83	SD = 9.31 SEM = 1.94	SD = 6.54 SEM = 1.36	SD = 13.44 SEM = 2.80	SD = 13.10 SEM = 2.73
Mean diff- erence L1 – L2	6.5 *	4.8 ***	4.8 *	3.5 ^{ns}	4.6 **	11.5 ***	4.9 ^{ns}
	SEM = 2.49 d = 0.75	SEM = 1.36 d = 0.99	SEM = 1.86 d = 0.75	SEM = 1.96 d = 0.53	SEM = 1.42 d = 0.93	SEM = 2.83 d = 1.19	SEM = 2.92 d = 0.47

***significant at the .001 level. **significant at the .005 level. *significant at the .01 level. ^{ns} not significant.

As in the other studies, L1 listeners made very few mistakes. The L2 listeners also performed well, with a mean level of accuracy of over 90% in the tasks that focused on a single functional morpheme (sections 1 – 5 & 7). However, there was greater variation in their performances. In the task where listeners were required not only to recognise the presence or absence of one (or two) reduced functional words, but also to recognise what the words were (section 6), the level of accuracy dropped by 11.5% for the L2 listeners but the L1 listeners' level of accuracy seemed unaffected.

Overall, even in such focused tasks, the L2 group did not perform as accurately as the L1 group in any section, although we did not find a significant difference between the two groups in Section 4 where listeners were required to recognise the presence or absence of the -s morpheme (reduction of *has*), nor in Section 7 which included the nonce verb. The L2 listeners performed best in Section 4 out of all the sections, and the L1 listeners had the greatest level of variance in Section 7 with the nonce verb. This may account for the lack of significant difference between the two groups in these two sections.

We compared Sections 5 and 7, as both required listeners to recognise the reduced form of *have*, encliticized to a modal verb. Both groups seemed to perform a little better (1% for the L1 group and 1.3% for the L2 group) in Section 5 which had real lexical verbs than in Section 7 which included the nonce verb. However, neither difference was significant and there was no real effect size.

L1 group: difference between Sections 5 and 7 = 1.0%, SD = 5.905, SEM = .93,
p = .291, d = 0.17.

L2 group: difference between Sections 5 and 7 = 1.3%, SD = 11.50, SEM = 2.40,
p = .592, d = 0.11.

This would suggest that the inclusion of the nonce verb made little difference to the task of recognising the presence or absence of the reduced auxiliary verb in this study overall.

However, the fact that the L1 listeners had a much larger in-group variance in Section 7 than in any other section is noteworthy and may suggest that the inclusion of the nonce words did have some effect on the L1 listeners. The L2 in-group variance was also relatively large, but marginally less than in Section 6, and only a small amount larger than in Section 1. Therefore, while the differences between Sections 5 and 7 were not significant for either group, there is some suggestion that the use of nonce words did have some effect on some individuals, but the evidence is inconclusive.

ii. Correlations between sections

We ran a Spearman's rho non-parametric test of correlation in SPSS (version 25) to investigate relationships for the groups between the different sections.

For the L1 listeners, we only found a significant correlation between Sections 1 (pronoun + 've) and 7 (modal verb + 've + nonce verb). This correlation was moderate, $r = .445$, $p < .01$.

For L2 listeners, we found significant correlations between all sections except for Sections 4 (pronoun + 's) and 5 (modal + 've). The correlations ranged from moderate to strong, (from $r = .422$ to $.748$).

iii. Percentages of 'not heard' errors and 'illusory' errors.

The percentages of 'not heard' errors, 'illusory' errors and 'confused' errors are shown in Table 25 and the differences between 'not heard' errors and 'illusory' errors for each group are shown in Table 26. The percentages were calculated on the total number of trials in each category, that is out of how many trials there were with relevant functors and without relevant functors. Section 6 also includes 'confused' errors where listeners

heard that there was a functor but did not identify it correctly. Mean differences between the two types of error within group were analysed in repeated measures t-tests in SPSS version 25.

Table 25: Percentage of 'not heard' errors (out of trials which included a relevant functor); percentage of 'illusory' errors (out of trials which did not include a relevant functor); percentage of 'confused' errors in Section 6 (out of trials which included a relevant functor).

Group	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
	Pronoun plus 've	Pronoun plus 'd	Pronoun plus 'll	Pronoun plus 's	Modal verb plus 've	Mixed past tenses and past modals	Modal verb plus 've (+ nonce verb)
	(have)	(would/had)	(will)	(has)	(have)	(they walked, they've walked, they'd walked, they'd 've walked)	(have)
L1 Not heard	1.9	2.7	1.0	0.25	1.2	1.25	2.08
L1 Illusory	5.0	2.0	2.25	1.25	0.8	1.0	2.25
L1 Confused						0.3	
L2 Not heard	5.6	6.8	3.9	12.6	2.2	5.9	5.8
L2 Illusory	20.0	8.7	12.6	3.5	6.1	11.3	10.4
L2 Confused						2.5	

Table 26: Mean differences between 'not heard' errors and 'illusory' errors within group given together with SD, SEM and effect size d. + = a higher percentage of 'illusory' errors to 'not heard' errors. - = a lower percentage of 'illusory' errors to 'not heard' errors.

Group	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
	Pronoun plus 've (have)	Pronoun plus 'd (would/had)	Pronoun plus 'll (will)	Pronoun plus 's (has)	Modal verb plus 've (have)	Mixed past tenses and past modals (they walked, they've walked, they'd walked, they'd 've walked)	Modal verb plus 've (+ nonce verb) (have)
L1	+ 3.1*	- 0.7 ^{ns}	+ 1.25 ^{ns}	+ 1.0 ^{ns}	- 0.4 ^{ns}	- 0.25 ^{ns}	+ 0.17 ^{ns}
	SD = 8.49 SEM = 1.34 d = 0.37	SD = 5.61 SEM = .89 d = 0.12	SD = 4.51 SEM = .71 d = 0.28	SD = 4.00 SEM = .63 d = 0.22	SD = 2.94 SEM = .46 d = 0.24	SD = 2.96 SEM = .47 d = 0.08	SD = 8.80 SEM = 1.39 d = 0.02
L2	+14.4**	+ 1.9 ^{ns}	+ 8.7*	- 9.1 ^{ns}	+ 3.9 ^{ns}	+ 5.4 ^{ns}	+ 4.6 ^{ns}
	SD = 12.21 SEM = 2.55 d = 1.18	SD = 15.13 SEM = 3.16 d = 0.13	SD = 16.84 SEM = 3.51 d = 0.52	SD = 21.18 SEM = 4.42 d = 0.43	SD = 16.29 SEM = 3.40 d = 0.24	SD = 13.62 SEM = 2.84 d = 0.40	SD = 16.11 SEM = 3.13 d = 0.29

***significant at the .001 level. **significant at the .005 level. *significant at the .01 level. ^{ns} not significant.

L1 listeners made very few errors, possibly too few to draw useful conclusions about differences between errors of not hearing functors and hearing illusory ones. L2 listeners seemed to make more 'illusory' errors than 'not heard' errors across most sections; however, these results were not significant apart from in Sections 1 and 3, and effect sizes were mainly small, apart from in Sections 1 and 3 where it was large and medium respectively.

iv. Correlations between length of time spent in the UK and levels of accuracy

In respect of correlations between exposure to English and levels of accuracy, we did not have sufficiently accurate information about all L2 participants' language levels to run a sound test of correlation based on language levels. Some people had been in the UK for a number of years after taking their last English language test, and we could not therefore be sure how much their language abilities had developed during this time. All we can say with certainty is, that the English language level of all participants was higher than 6.5 IELTS.

We did, however, run a non-parametric Spearman's rho test of correlation (in SPSS version 25) for the relationship between length of time spent in the UK (measured in number of weeks) and accuracy. We found that correlations were either weak or very weak, and were negative apart from in Section 3. None of the correlations were found to be significant, with p ranging from .145 to .955.

2.8 Chapter discussion

The total number of responses made by L2 listeners across the five studies was 20,685. This amounted to 534 test scores. In Table 27 below we show the mean levels of accuracy for the test scores across all the studies.

Table 27. Levels of accuracy across Studies 1 – 5, shown in %.

Participants’ Language Levels	Study 1	Study 1	Study 2	Study 2	Study 3	Study 4	Study 5	Study 5
	<i>Short</i>	Long	<i>Short</i>	Long		Sect. 1	Sect. 1-5 & 7	Sect. 6
L1	97.1	91.3	98.4	95.4	99.0	–	98.3	98.0
L2 - IELTS 6.5 +	83.8	73.3	86.3	77.7	88.5		93.4	86.5
L2 - IELTS 5.5 – 6.0	77.3	64.7	76.5	65.8	80.1	74.3 IELTS 6.0+	–	–

As the results show, all the L2 listeners in the five studies were able to recognise the presence of all the types of functional morphemes we presented to them, irrespective of their first languages. None of the L2 participants were unable to recognise any type of functional morpheme.

It is important to mention issues around checking that the recorded production of functors was as expected. In Studies 1 – 3, the recordings were checked manually by only one L1 listener, and this proved to be insufficient in eliminating error completely. When inputting the participants’ responses into Excel files, we discovered a discrepancy in the results. This led us to re-exam the recorded items by running them through the software PRAAT²⁶ to verify whether the recorded functors had initially been assessed correctly. As mentioned previously in Section 2.2, when re-examining the functors in the items, it appeared that three items had been problematic in Study 1. When we re-checked the sound recordings, we found room for error in determining whether or not the functional morpheme was present, since the PRAAT analysis showed the sounds to be almost indiscernible. The participants’ responses to the three items were then removed from the data in Study 1 prior to the data being analysed. We did not detect any issues with the

²⁶ PRAAT was developed by Paul Boersma and David Weenink at the University of Amsterdam and is a software package for speech analysis in phonetics and voice analysis.

items from Studies 2 and 3 when checking these in PRAAT. The items for Studies 4 and 5 were subsequently checked by four independent L1 listeners to ensure they were fit for the behavioural studies. All four listeners agreed that the functors had been recorded as expected, and it was not deemed necessary to run the items through PRAAT at the time. However, we acknowledge it may generally be useful practice to run a technological analysis on items presented aurally.

In respect of Studies 1 – 5, it is worth noting that the five studies were not equal but included different types of tasks and different levels of complexity. It was therefore not useful to make a direct comparison between them in terms of overall levels of accuracy.

In Study 1, participants were required to identify the verb in a variety of sentences and to pay attention as to whether the verb ending included an inflected functional morpheme (- a regular past tense ending). In Study 2, participants were required to process a greater portion of each of the sentences than in Study 1, in order to identify the presence or absence of the reduced auxiliary verb *have* functional morpheme, as this could have been presented either as a pronoun clitic or as a modal verb clitic. In Study 3, participants were primed on the root of the word they needed to identify, and were then asked to identify the whole of the surface form of the word - that is, to identify the root word plus the derivational morphemes. In Studies 1 – 3, each sentence was individual and differed from all the others, so the participant did not know what sentence context to expect, and they may have become distracted by the context if it was something that interested them in some way. In these three studies, participants may have been influenced by semantic top-down processing when responding. In Study 1 in particular, participants may have been influenced by whether they expected the event/situation to be one that was regularly repeated (present tense), or one that took place in the past. In Study 3, participants are likely to have used their knowledge of grammar to filter their responses, if they were able to – thus, even if they did not clearly recognise the derived morpheme, they may have been able to write it correctly.

In study 4, participants were asked to identify whether one pre-selected word in a sentence included a particular inflectional morpheme suffix. Participants knew in advance what the sentences were. Similarly, in Study 5, participants knew in advance what the sentences were and, here again, they were required to identify whether one pre-selected word had an enclitized functional morpheme. In Sections 1 – 5 and in Section 7 of Study 5, they were merely required to recognise the presence or absence of the morpheme, but in Section 6, they were additionally required to identify whether there were one or two functional morphemes and what the morphemes were. In Studies 4 and 5, top-down semantic processing of the sentences could make no difference to responses nor could knowledge of grammar.

Responses may thus have required different levels of attention and processing and may have been influenced differently across the five studies. In Studies 1 – 3, there may have been distractions while participants processed the semantic contexts, and semantic contexts may have caused top-down processing to influence listeners' bottom-up perceptions. Moreover, knowledge of grammar is likely to have played a role in Study 3. Such influences should not have been relevant in Studies 4 – 5. Differing levels of complexity may also have affected responses: Studies 1 – 3 required more language processing than Studies 4 – 5. Study 2 required most cognitive effort as it involved three tasks: the identification of two different types of words, recognition of the reduced auxiliary verb in the sentence, and identification of the auxiliary verb's position. Section 6 of Study 5 required more cognitive effort than the other sections of the Study 5 because it involved the recognition of one out of four possibilities rather than one out of two.

The main differences between the five studies are outlined in Table 28 below.

Table 28. Main differences in design between Studies 1 – 5.

Study	Number of words in sentences	Each sentence different	Sentences known before listening	Priming on word for attention	Task	Possibility of influence from top-down processing related to semantic context	Choices
Study 1	<i>Short:</i> 4 – 6 <i>Long:</i> 10 – 15	Yes	No	No	Identify lexical verb & recognize inflected morpheme	Yes	1 out of 2
Study 2	<i>Short:</i> 5 – 6 <i>Long:</i> 10 – 15	Yes	No	No	Identify pronoun & modal verb and recognize presence and location of clitic ending	Yes	1 out of 4
Study 3	15 – 18	Yes	No	Yes	Recognize full form of pre-selected root word	Yes Plus influence from knowledge of grammar	N/A
Study 4	<i>Sect. 1:</i> 6 & 8 <i>Sect. 2:</i> 8	No * 2 sentences repeated many times in section 1 * 1 sentence repeated many times in section 2	Yes	Yes	Recognize presence of inflected morpheme on pre-selected word	? Not useful	1 out of 2
Study 5, sections 1-5 & 7	5 – 10 <i>Clitics counted as two separate words</i>	No * 1 – 3 sentences in each section repeated many times	Yes	Yes	Recognize presence of clitic endings on pre-selected pronouns or modal verbs	? Not useful	1 out of 2
Study 5, section 6	5 – 7 <i>Clitics counted as two separate words</i>	No * 1 sentence repeated many times	Yes	Yes	Recognize presence of clitic endings on pre-selected pronouns or modal verbs & identify clitics	? Not useful	1 out of 4

* each sentence was presented many times with and without the relevant functional morphemes

Despite these differences across tasks, the results of the five studies taken together have provided some interesting findings, as discussed below.

First. Lexical Segmentation.

Overall, L1 listeners made very few errors. L2 listeners made more errors and their performances varied but, in the majority of trials, they were able to accurately identify the presence or absence of the relevant functional morphemes. This entailed that they had accurately segmented the relevant word from its neighbours. Levels of accuracy in Studies 1, 2 and 3 are particularly of interest in this respect since the input involved completely unknown sentences with a variety of words in unexpected contexts.

Second. Perceptual discrimination.

However, we should bear in mind that, in the studies wherein choices were binary (1 out of 2), we cannot be certain that participants perceptually recognised the sounds representing the morphemes, only that they did notice the presence or absence of a sound. In Study 5, section 6, participants were asked to identify which morpheme they heard. For L1 listeners, correct identification did not seem to be a problem at perceptual level. However, the L2 participants made a number of errors in this respect. Results for the L2 participants in Section 6 show that their mean level of accuracy was approximately 7% lower than that of the other, binary-choice, sections of Study 5 combined. This suggests that even when L2 listeners heard reduced auxiliary verbs or reduced modal verbs, they did not necessarily identify them correctly at a perceptual level, as the sound-meaning representation they had of these reduced function words was not always accurate. Such findings point to the likelihood that L2 listeners may generally be building some networks of inaccurate morpho-syntactic associations while they listen.

Third. Salience.

It would seem that salience does make a difference, and functional morphemes are less difficult for L2 listeners to recognise when they carry a little stress, such as when they are a separate syllable. In both Studies 1 and 2, the more salient functional morphemes, the /ɪd/ articulation of the past tense *-ed* inflection and the /əv/ articulation of the reduced auxiliary verb *have*, proved easier for the L2 participants to recognise than the /d/, /t/ and /v/ articulations. We also saw this to a more limited extent in Study 3, where L2 listeners sometimes failed to accurately report the unstressed penultimate morpheme of adverbs. In Study 3, we further found significant differences between accuracy levels for the three word classes for the lower L2 group. This may in part be due to some noun endings having a secondary stress, whereas adjective endings and adverb endings are usually unstressed - this would make some of the noun endings slightly more salient than most of the adjective or adverb endings. In Study 4, the difference between a stressed and an unstressed morpheme did not exist; but in Study 5, we saw a slightly better performance in Sections 5 and 7 where the reduction of *have* was articulated as a separate morpheme than in Section 1 which included the reduction of *have* articulated as part of the pronoun syllable.

Fourth. Judgements about the position of the reduced auxiliary verb.

In Study 2, which focused on a reduced auxiliary verb, L1 listeners made very few errors. Some of the L1 listeners reported that if they found the response straightforward, they wrote it quickly, but if they were unsure, they replayed the sentence in their minds before responding.

The L2 listeners made considerably more errors than the L1 listeners in this study - errors which included confusing the position of the reduced auxiliary verb in the sentence. Confusing whether the reduced auxiliary verb was a clitic to a pronoun or to a modal verb, does not necessarily mean that the sensory input at the perceptual level was misperceived, but it could mean that judgements about the perceptual input may have been overridden subsequently by selective attention at the perceptual report. Either way, this suggests that, for some L2 listeners, the echoic memory of the relevant parts of some of the sentences was either not created, or was considerably less robust and with shorter duration than it was for the L1 listeners. We predicate this on the fact that L2 listeners were unable to rely on echoic memory to check the relevant structures mentally.

Fifth. Increased input, decreased accuracy.

The tasks involved in all five studies were short and focused, and participants were not put under time pressure to recognise the morphemes. However, in Studies 1 and 2, we presented both short sentences and sentences which were a little longer. Here we see that levels of accuracy decreased for both groups of L2 listeners when spoken input increased. That is, in the longer set of sentences, L2 participants performed less accurately by approximately 10 % than in the shorter set. This decrease in level of performance is also seen for L1 listeners, although the decrease is less – around 6 % in Study 1 and around 3 % in Study 2. One possible explanation for this is that an increased input increases the need for attentional control and thus increases the load on working memory, which subsequently affects online processing ability. If working memory is less robust in an L2 as is believed, L2 listeners would be more affected than L1 listeners, which could account for the differences between the L1 and the L2 groups.

Sixth. Illusory morphemes.

In all the studies where we asked participants to recognise the presence or absence of a functional morpheme – that is Studies 1, 2, 4 and 5 – we found cases where participants reported hearing morphemes that had not been spoken, that is illusory morphemes.

There may be two possible reasons for this. The first, that participants were using top-down semantic knowledge which overrode the bottom-up perceptual recognition. The second, that noise created by carry-over from other trials interfered with judgements. Either could have caused the participants to ‘hear’ morphemes that were not present.

For L1 participants, we favour the first explanation for both Studies 1 and 2. In Study 1, the majority of the few errors created by L1 participants were illusory ones. It makes sense that, in addition to listening for the past tense morpheme, participants used the semantic context of the sentences to decide whether the actions were one-offs (in the past) or regular actions (in the present). This also seems a plausible explanation in the longer sentences of Study 2, where there was more semantic context. This explanation may be supported by the fact that L1 listeners made proportionately fewer ‘illusory’ errors in the shorter sentences where there was very little semantic context – moreover, the mean difference between ‘illusory’ errors and ‘not heard’ errors was not significant in the shorter sentences in Study 2. Moreover, in Study 5 where sentence context was of little use, we did not find L1 listeners to be making significantly more illusory errors.

The L2 listeners displayed less evidence of top-down processing playing a role in Study 1 or in the longer sentences of Study 2. Here the ‘not heard’ errors and ‘illusory’ errors were roughly equal, which was similar to Study 4 where context could not be used for semantic judgements. In the short sentences in Study 2, there were relatively more ‘illusory’ errors than ‘not heard’s; since there was little semantic context to elicit top-down semantic processing, we suggest that the higher proportion of ‘illusions’ was more

likely to be due to the second explanation, that of noise from other trials carrying over to interfere with judgements. However, some of the errors may simply have been due to L2 listeners not being sure what they had heard and guessing erroneously.

In Study 5, the differences between ‘not heard’ errors and ‘illusory’ errors were not significant for the L1 listeners in any of the sections. Sentence contexts, semantic or syntactic, could not be used to affect morpheme recognition, and no particular patterns of ‘not heards’ versus ‘illusory’ errors were found. For the L2 listeners, differences between the two types of morphemes were significant only for Sections 1 and 3 (pronoun + ‘ve and pronoun + ‘ll). In these two sections, L2 listeners made proportionately more ‘illusory’ errors. We suggest that this was due to carry-over of noise affecting perceptual judgements as with the short sentences in Study 2.

Seventh. The inclusion of nonce words.

In Studies 4 and 5 we included nonce words. Our intention with nonce words in Study 4 was to find minimal pair words that varied only by whether the final consonant was voiced or voiceless and also to reduce semantic context since nonce words have no real semantic meaning. This was done in the context of testing listeners’ abilities to recognise the presence or absence of inflections. In Study 5 the aim was to compare the effect of nonce words versus real words on listeners’ abilities to recognise the absence or presence of verb phrase functors. Nonce words have been used in a variety of ways in psycholinguistic studies, including one by Shafer et al. (2005) who found that adult listeners were able to recognise the presence of the definite article ‘the’ irrespective of whether other words in the sentence were real ones or nonce ones. Ozubko and Joordens (2011) suggested that the effect of nonce words is not comprehensively understood, but that nonce words have impoverished semantics compared with real words and there is therefore a lower cognitive level of response to them.

In Study 4, nonce words aided the design of the test, and did not prevent the L2 listeners from completing the inflection-recognition tasks. In this study there was nothing to suggest whether, or how, nonce words might have affected listeners.

The results from Study 5 did not provide significant differences in listeners' performances between sentences in which the verb was a nonce word and comparable sentences in which the verb was a real word. Nevertheless, the section with the nonce verb led to a much larger degree of variance among L1 listeners than did any of the other six sections with real verbs. Although the degree of variance was relatively large too for the L2 listeners in respect of the nonce verb section, this did not stand out since the L2 group variance was also large in two of the six sections with real verbs. One possible explanation for this could be that L2 listeners are used to listening to words they do not know, whereas this is much rarer for adult L1 listeners, giving rise to a noteworthy larger variance in performance for the L1 group. This may further account for why there was no significant difference between the results of the L1 and L2 groups in the nonce verb section (Section 7).

Eighth. Correlations between language level or time spent in the UK and levels of accuracy.

The mean levels of accuracy in Studies 1 – 3 suggest that, on average, participants with a higher level of English performed more accurately than participants with a lower level of English. However, in Study 4, some of the higher level participants with IELTS equivalences of 7 – 8.5 in fact performed less accurately than some of the participants with lower English levels. This does not show a clear pattern of results.

Tests of correlations between language levels and levels of accuracy for the participants in Studies 1 – 3 (Table 15) showed a significant but moderate positive correlation (r ranged from .375 to .468 in Studies 1 and 2, and was .530 in Study 3). In contrast, in Study 4 the correlation was shown to be negative and non-significant. We would suggest that the results in Study 4 may be skewed due to the limited number of participants with the slightly higher English language levels. We did not have enough data about language levels to run this test with the participants in Study 5.

The results for the participants for Studies 1 – 4 indicate that higher levels of English can make a difference for many people in relation to accurately recognising functional morphemes, but that they do not necessarily do so for everyone. Therefore, this relationship cannot be assumed to be positive nor linear as there are variations between people, and some listeners with higher levels of English proficiency were less accurate than some listeners with lower levels.

In respect of whether a longer length of time spent in the UK leads to listeners becoming more accurate in recognising functional morphemes, we again found a significant and positive correlation for the L2 participants in Studies 1 -3, although this correlation was weak (r ranged from .273 to .300). In Study 4, we again did not find a significant correlation, possibly due to the limited numbers. In Study 5, we found correlations to be weak or very weak and not significant.

The non-significant results in respect of exposure to English in Studies 4 and 5 may be due to the small number of L2 participants in these two studies, 24 and 23 respectively. The results from the participants in Studies 1 – 3 are, however, are interesting, and suggest that exposure to English alone does not necessarily lead to native-like performance in recognising functional morphemes.

2.9. Conclusion

In Studies 1 – 5, we set out to investigate three research questions. Having considered the results of the studies, we propose to answer the research questions in the following way.

Answer to Question 1. Can, and to what extent do, L2 listeners hear and recognise reduced functors?

Having examined the data for all individuals, participant by participant, we found that all the L2 listeners, irrespective of their L1, were able to recognise all the types of functional morphemes presented in the study and to perform the required tasks even though they did not process the information accurately in all sentences. Some L2 listeners were able to hear some sets of morphemes with 100% accuracy, but others struggled, and thus the means for levels of accuracy among the L2 groups varied across studies from 95.9% in Section 4 of Study 5 to 64.7% for the L2-lower group in the longer sentences in Study 1. The lowest levels of accuracy we found were 37.2% for one L2-lower listener in the longer sentences in Study 1, and 33.3% and 36.7% respectively for two L2-lower listeners in the longer sentences in Study 2. Two L2-higher listeners scored 40% and 43.3 % for accuracy respectively in the longer sentences in Study 2. There were six further scores below 50% in Studies 1 – 2 (all by L2-lower listeners at between 40% to 48.8%), but all the remaining scores were over 50%. All L2 scores were over 65% in Study 3 apart from one at 58% by an L2-lower listener. In Study 4, all listeners scored higher than 50% for accuracy apart from one, who had been speaking English as their second language since early childhood, and who scored just 45% for accuracy in the past tense morpheme test. In Study 5, we found just one score under 50% (at 45%). Thus, out of the total 534 test scores (based on 20,685 responses) made by L2 listeners across the five studies, only 13 were under 50%.

Out of the 534 test scores for the L2 listeners, 78 were of 100% accuracy, demonstrating that L2 listeners are able to perform with high levels of accuracy, even though they may not do so consistently. The scores for 100% accuracy were distributed across the tests as follows: 8 in Studies 1 – 3, 1 for the past tense endings in study 4, 8 for the plural endings in Study 4, and 61 in Study 5. The frequencies for the variety of percentages are shown in Appendix 1f.

L2 listeners did not recognise morphemes consistently, with most participants making varying amounts of errors. This may not be surprising since such inconsistency of performance has also been reported in other studies, for instance Johnson, Shenkman, Newport and Medin (1996) reported that their participants responded differently on the same auditory test given three weeks apart, and Ellis (1988) who found that participants responded inconsistently even within a sentence.

The data also show that increasing the amount of spoken information in Studies 1 and 2 decreased listeners' ability to attend to inflected morphemes and reduced auxiliary verb clitic endings. From this we may extrapolate that in longer stretches of speech, L2 listeners are likely to recognise even fewer of the functional morphemes. Although we are unable to quantify this, we would point out that when we increased the number of syllables roughly two to two and a half fold, accuracy levels dropped by roughly 10%. However, it is useful to point out that usually, when people listen, they do so within a context, and they may use the context to aid comprehension through top-down processing to compensate if, and when, they have not recognised the morpho-syntax of the sentences.

The data from Study 2 additionally show that L2 listeners were at times aware of the presence of a reduced auxiliary verb in the sentence but failed to recognise its position since they made errors as to whether it was a pronoun clitic or a modal verb clitic. Moreover, section 6 of Study 5 shows that even when listeners recognised the presence of

a functional morpheme, they did not always recognise whether it represented ‘has’, ‘had’, or even ‘would have’. Thus, problems for L2 listeners include: not recognising the presence of a morpheme, hearing illusory morphemes, mis-identifying what the morpheme is, and mis-identifying the morpheme’s role in the sentence.

The data from Study 3 indicates that L2 listeners overall achieved a higher level of accuracy in recognising noun endings than adjective or adverb endings although this finding was only significant for the lower level L2 group. It is likely that L2 listeners encounter nouns more frequently than the other two word classes and that familiarity was therefore a relevant factor for recognising derived morphemes, at least for the L2-lower participants.

Finally, in our data, L2 listeners performed better when functional morphemes were more salient. We refer to DeKeyser’s (2005) observations that L2 listeners have a tendency “to ignore the morphological cues to sentence meaning” (page 7), and his suggestions that L2 listeners struggle to notice functional morphemes as these are usually unstressed in spoken English and therefore less salient overall. Our data agrees that L2 listeners miss a high number of the unstressed functional morphemes. Furthermore, our data suggests that when functional morphemes are slightly more salient, as in the case of morphemes spoken as separate syllables, listeners identify them slightly more easily and therefore morpheme salience does play a part for L2 listeners. However, to concur with Ellis (2006), it is likely that salience is only one factor of importance in morpheme identification, because salience alone in our studies did not lead the participants to L1-like levels of accuracy.

Answer to Question 2. Are there differences in the abilities of L2 listeners and L1 listeners to recognise reduced functors in focused listening tasks?

As the data show, L1 listeners recognised the functional morphemes we presented with almost perfect levels of accuracy, even when no semantic nor syntactic cues served as obligatory contexts. Their mean scores were higher than 97.0% across all tasks apart from the longer sentences in Studies 1 and 2, where the mean scores were 91.3% and 95.4% respectively. As mentioned above, the mean levels of accuracy across studies and sections ranged from 95.9% to 64.7% for the L2 listeners, compared to the range from 99.3% to 91.3% for the L1 listeners. In Studies 1 and 2, when sentence lengths were increased, the mean differences between the L1 listeners and the L2 listeners increased too.

Whilst L1 listeners performed slightly less well in the longer sentences than in the shorter sentences in Studies 1 and 2, in contrast to the L2 listeners, their performance seemed unaffected by the additional recognition task in Section 6 of Study 5, compared with the other sections of the study. L1 listeners seemed to detect the phonemic differences between the *-ve* and the *-d* morphemes which represented *have* and *had* to a near perfect level, while L2 listeners struggled with this fine-level discrimination.

The high level of accuracy among L1 listeners is particularly interesting because previous psycholinguistic research has shown, in optimal listening conditions, that L1 listeners tend to rely on lexical-semantic knowledge rather than sub-lexical syntactic cues for sentence comprehension in optimal conditions (e.g. Mattys & Wiget, 2011; Oakhill, Garnham & Vonk, 1989). As discussed in Chapter 1, Oakhill, Garnham & Vonk (1989) further point out that an L1 listener is able to hold on to the exact form of a sentence for a little longer than a few seconds in order to retrieve it for more detailed processing to take place. The data in our studies seem to be in accord with such an ability among L1 listeners, given the relatively few errors made by the L1 participants even when cognitive loads were

increased. The L1 listeners seemed, in the main, to be able to hold the exact form of relevant parts of the sentence in echoic memory in order to check their recognition of the functional morphemes. The ability to recall sentences in echoic memory – to replay sentences mentally – in order to re-analyse their surface form, does not seem as robust in L2 listeners as in L1 listeners.

Moreover, there is a possibility that L2 listeners are less likely than L1 listeners to pick up morpho-syntactic information accurately when presented with longer, rather than shorter, speech input. This may be related to issues of working memory whereby memory becomes affected by noise from increased amounts of information and the ensuing need for more selective attention control.

All this begs the question then as to whether the higher levels of errors for L2 listeners were due to issues of perception and recognition or to issues associated with a less robust form of echoic or working memory, or possibly a combination of both.

Answer to Question 3. What can we learn from the studies about L2 listeners' abilities in respect of functors?

The results of the correlation tests show that some L2 listeners will develop their ability to recognise functional morphemes as their overall language levels develop or as they have more exposure to the target language. However, the results also show that not all do. We suggest that listening ability in respect of functional morphemes and grammar recognition should not be taken as a given as L2 learners develop their overall language levels. Nor should it be taken as a given that more exposure to the target language will result in a better ability to recognise functional morphemes and utilise these in sentence comprehension. There is little evidence in our results that we can expect exposure to the

target language alone to improve L2 listeners' abilities to recognise functional morphemes to L1 efficiency.

Overall, we recommend that for L2 language listeners to achieve greater levels of accuracy when listening, there is a need for language learners to receive both exposure to L1 speech and, additionally, to specific training on recognising functional morphemes and their role within sentences while listening to spoken language. Language teachers should be aware that there is a risk that L2 listeners may generally be building some networks of inaccurate morpho-syntactic associations while they listen.

2.10 Limitations

Unfortunately, we were not able to make comparisons between the abilities of L2 participants to recognise the various types of functional morphemes across the five studies due to the differences in tasks. Therefore, we were not able to contribute to the discussions around differences in processing inflectional morpheme versus derivational morphemes.

If we were to re-conduct such studies, we could ensure that the methods of testing the different types of morphemes were equal and systematic. However, this insight comes as a result of conducting the present studies.

Chapter 3 – Study 6

Research into the effect that a deficiency in morpheme recognition has on sentence reconstructions.

3.1 Overview of the study

This chapter explains and discusses the methodology and results for the 6th study in the project.

In Studies 1- 5, we found that L2 listeners in the main recognised functors in connected speech to a lesser extent than L1 listeners did. L1 listeners made very few errors overall across the tests. In Study 6, we extended the investigation to include L2 listeners' abilities to listen to, and reconstruct, whole sentences. Study 6 was divided into two parts, and in the first part, we used the tests from Studies 1 – 5 to test the abilities of four case study L2 participants to recognise functors and compared their results with those of the original participants. The four case study participants' abilities to recognise whole sentences was then investigated through a form of sentence dictation, in which the participants listened to recordings of sentences and reproduced them immediately afterwards. In this way, we were able to investigate whether a deficit in recognising functional morphemes would impact on L2 listeners' abilities to reproduce the sentences they heard.

In this study, participants were able to use their knowledge of language and of grammar to filter their reconstructions of the sentences.

To test the validity of the sentence dictation task, we additionally recruited another 31 participants (twenty-six L1 listeners and five L2 listeners) to conduct the task.

In the second part of Study 6, we provided training to the four case study participants to facilitate their awareness of reduced functors. Following the training sessions, the four

listeners took a post-training test, commensurate to the pre-training test, to see whether training had had an impact.

3.2 Aims and research questions

The four research questions for the thesis were:

Research question 1: Can, and to what extent do, L2 listeners hear and recognise reduced functors?

Research question 2: Are there differences in the abilities of L2 listeners and L1 listeners to recognise reduced functors in focused listening tasks?

Research question 3: What can we learn from the studies about L2 listeners' abilities in respect of functors?

Research question 4: Can we find techniques to improve L2 listeners' abilities in respect of processing functors and utilizing them in sentence reconstructions?

The intention with Study 6 was to address thesis Research questions 2, 3 and 4.

Study 6 was divided into two parts: preliminary and pre-training tests followed by training and a post-training test. The main aim with the first part of Study 6 was to investigate whether a reduced ability to recognise functors in connected speech would impact on the ability of an L2 listener, with a high level of L2 English, to mentally reconstruct and reproduce the surface form of a spoken sentence. Would listeners be able to reconstruct the structure of a sentence they had heard using their knowledge of grammar, or might

they substitute it with another comparable structure to reproduce the meaning of a sentence accurately? The aim with the second part of the study was to trial whether a training programme based on noticing functors in spoken texts would reduce functional morpheme deficits when listening.

The two study-specific research questions for Study 6 were then:

- a. Does a reduced ability to recognise functional morphemes in connected speech entail a reduced ability to reconstruct and reproduce spoken sentences with accuracy?
- b. Is it possible to improve an L2 listener's ability to reproduce spoken sentences more accurately through training of speech-sound recognition of functional morphemes?

Study-specific research question a. would help to address the thesis Research questions 2 and 3, since we would be comparing the performances of the four case study participants with those of L1 listeners (Research question 2) and also investigating the impact of possible deficits in respect of functor recognition (Research question 3). Study-specific research question b. would address the thesis Research question 4 by trialling training techniques.

3.3 Case study participants

Four L2 participants agreed to take part in the case studies. They were all academic lecturers, who volunteered to take part out of interest in the study and out of interest in developing their own listening skills. The participants were assigned the participant numbers 901, 902, 903 and 904.

Table 1 shows the profiles of the participants. They were all fluent L2 English communicators and were categorised as advanced English language speakers in line with the Common European Framework with Reference to Languages (CEFR) descriptors. Participants 901, 902 and 903 with levels of low C2 were in fact categorised as proficient.

Table 1. The four case-study participants in Study 6.

Participant	First lang.	Age group	Gender	Age started learning English	Time in UK	English language level
901	Russian	36 - 45	male	10 years	9 years	CEFR C2 (low) equivalent to <i>IELTS 8.5 / TOEFL 115-117</i>
902	Russian	26 - 35	female	11 years	5 years	CEFR C2 (low) equivalent to <i>IELTS 8.5 / TOEFL 115-117</i>
903	Russian	36 - 45	male	12 years	5 years	CEFR C2 (low) equivalent to <i>IELTS 8.5 / TOEFL 115-117</i>
904	Portuguese	36 - 45	female	12 years	18 months	CEFR C1 (low) equivalent to <i>IELTS 7.0 / TOEFL 94-101</i>

3.4 Part 1 of the study: preliminary test

3.4.i. *The preliminary test*

In order to know whether the participants did have a deficit in functional morpheme recognition in connected speech, we started by testing the four participants with the tests used in Studies 1, 2, 3 and 5. Through the results from these tests, the participants' levels

of morpheme recognition could be compared with those of the original participants in the previous studies.

The four participants were tested together as one group, and the procedure was the same for this group as for the original participants, although the Study 6 participants took all four tests in one longer testing session. The tests from Studies 1, 2 and 3 were conducted first and with short breaks between them, as when originally administered. There was then a longer break of around half an hour for refreshments before the tests from Study 5 were administered. As with the original groups, the sentences were played once only.

The results for the tests from Studies 1, 2 & 3 are shown in Tables 2 and 3. Tables 4 and 5 show the results from the tests used in Study 5. Means and mean differences were analysed in SPSS version 25.

3.4.ii. *Tests from Studies 1 - 3*

Table 2 below shows the results for the tests used in Studies 1, 2 and 3, and compares the case study participants' results with those of the original participants.

Table 2. Results from the tests used in Studies 1, 2 and 3. Results show mean levels of accuracy in %.

Participants	Study 1 – past tense inflections (short sentence)	Study 1 – past tense inflections (long sentence)	Study 2 – clitics -ve (short sentence)	Study 2 – clitics -ve (long sentence)	Study 3 – Word class (noun, adjective, or adverb)	<i>Mean of all five tests</i>
L1 group from Studies 1 – 3 N = 38	97.1 SD = 4.12 SEM = .67	91.3 SD = 6.30 SEM = 1.02	98.4 SD = 2.53 SEM = .41	95.4 SD = 6.03 SEM = .98	99.0 SD = 1.84 SEM = .30	96.2
L2-higher group from Studies 1 – 3 N = 25	83.8 SD = 8.95 SEM = 1.79	73.3 SD = 10.42 SEM = 2.08	86.3 SD = 8.46 SEM = 1.69	77.7 SD = 14.30 SEM = 2.86	88.5 SD = 8.15 SEM = 1.63	81.9
L2-lower group from Studies 1 – 3 N = 40	77.3 SD = 9.12 SEM = 1.44	64.7 SD = 9.21 SEM = 1.46	76.5 SD = 13.71 SEM = 2.17	65.8 SD = 13.83 SEM = 2.19	80.1 SD = 8.95 SEM = 1.42	72.9
Participant 901	82.2	82.2	90.0	90.0	98.0	88.5
Participant 902	91.1	80.0	96.7	86.7	100.0	90.0
Participant 903	93.3	80.0	90.0	93.3	98.0	90.9
Participant 904	68.9	55.5	76.7	73.3	72.0	69.3
Mean of 901 – 904 N = 4	83.7 SD = 11.35 SEM = 5.67	74.4 SD = 12.66 SEM = 6.33	88.4 SD = 8.38 SEM = 4.19	85.8 SD = 8.77 SEM = 4.39	92.0 SD = 13.37 SEM = 6.68	84.9

L1 = first language speakers of English. L2 = second language speakers of English.

L2-higher = higher level L2 group: L2 speakers with IELTS equivalences of 6.5 – 8.5.

L2-lower = lower level L2 group: L2 speakers with IELTS equivalences of 5.5 – 6.0.

Comparisons with the original L2 groups:

Participant 901: Overall, Participant 901 performed better than the mean of the higher level L2-higher group except in the short sentences from Study 1. Participants 902 and 903 performed better in all tests. Despite her higher language level, Participant 904 performed worse in Studies 1 and 3 than the mean of the lower level L2-lower group, but a little better than the lower level group in Study 2.

Interestingly, Participant 901 did not seem to be affected by the increase in sentence length in the tests from either Studies 1 or 2. In the Study 1 tests, the other three participants were affected in the same way as the original participants were with a considerable decrease in accuracy in the longer sentences compared with the shorter ones. In Study 2, only Participant 902 showed a considerable decrease in accuracy when the sentences were lengthened similar to the decreases of the original groups. Participant 903 actually showed a small increase, and Participant 904 showed only a small decrease.

Comparisons with the L1 group:

As the results in Table 2 show, even with the advanced levels of English, none of the participants matched the mean L1 levels of accuracy in recognising inflected past tense endings of regular verbs (Study 1 tests) nor in recognising the clitic reductions of the auxiliary verb *have* (Study 2 tests). However, Participants 901, 902 and 903 performed with L1-like accuracy in the Study 3 test in respect of recognising derivational morphemes of content words.

While mean differences between the L1 group and the group of four case study participants were not significant for any of the studies, we did find large effect sizes for the differences between the groups in Studies 1 and 2, as shown below in table 3. The

effect size was medium in Study 3. Since 904 did not perform as well as 901 – 903, we analysed the mean differences between the L1 group and the whole Study 6 group (N = 4) and also between the L1 group and the three higher performing participants, 901 – 903 (N = 3). Effect sizes remained large for the latter, in fact they increased in both tests in Study 1 and in the test with short sentences in Study 2, although in Study 3 the effect size for the mean difference between the L1 participants and Participants 901 – 903 decreased from medium to small.

Table 3. Mean differences between the results of the L1 group in Studies 1 – 3 and the results of the case study participants in Study 6. Results shown in % with standard errors of the mean and Cohen's d effect sizes.

Mean difference between:	Study 1 – past tense inflections (short sentences)	Study 1 – past tense inflections (long sentences)	Study 2 – clitics -ve (short sentences)	Study 2 – clitics -ve (long sentences)	Study 3 – Word class (noun, adjective, or adverb)
L1 group (N = 38) and the case study group (N = 4)	13.3 ^{ns} SEM= 5.71 d = 1.57	16.9 ^{ns} SEM= 6.41 d = 1.69	10.1 ^{ns} SEM= 4.21 d = 1.62	9.5 ^{ns} SEM= 4.49 d = 1.28	7.0 ^{ns} SEM= 6.69 d = 0.73
L1 group and the case study group excluding Participant 904 (N = 3)	8.2 ^{ns} SEM= 3.46 d = 1.62	10.57*** SEM= 1.26 d = 2.21	6.2 ^{ns} SEM= 2.27 d = 1.89	5.4 ^{ns} SEM= 2.14 d = 1.11	0.3 ^{ns} SEM = .73 d = 0.20

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} p > .05.

3.4.iii. Tests from Study 5

Table 4 below shows the results for the tests used in Study 5, and compares the case study participants' results with those of the original participants.

Table 4. Results from the tests used in Study 5. Results show mean levels of accuracy in %. Group means shown together with standard errors of the mean.

Partici- pants	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7	Mean of all seven sect- ions
	Pronoun plus 've (have)	Pronoun plus 'd (would/ had)	Pronoun plus 'll (will)	Pronoun plus 's (has)	Modal verb plus 've (have)	Mixed past tenses and past modals (they walked, they've walked, they'd walked, they'd 've walked)	Modal verb plus 've (+ nonce verb) (have)	
L1 group from Study 5 N = 40	97.3 SD = 3.94 SEM= .62	97.5 SD = 3.20 SEM= .51	98.7 SD = 2.33 SEM= .37	99.4 SD = 1.47 SEM= .23	98.9 SD = 2.52 SEM= .40	98.0 SD = 2.61 SEM= .41	97.9 SD = 6.60 SEM= 1.04	98.2
L2 group from Study 5 N = 23	90.8 SD = 11.57 SEM= 2.41	92.7 SD = 6.07 SEM= 1.27	93.9 SD = 8.75 SEM= 1.83	95.9 SD = 9.31 SEM= 1.94	94.3 SD = 6.54 SEM= 1.36	86.5 SD = 3.44 SEM= 2.80	93.0 SD =13.10 SEM= 2.73	93.9
Partici- pant 901	95.0	92.5	97.5	100.0	92.5	90.0	97.5	95.0
Partici- pant 902	95.0	100.0	97.5	100.0	85.0	87.5	97.5	94.6
Partici- pant 903	100.0	95.0	92.5	100.0	97.5	82.5	100.0	95.4
Partici- pant 904	85.0	80.0	70.0	100.0	87.5	82.5	80.0	83.6
Mean of 901 - 904	93.8 SD = 6.29 SEM= 3.15	91.9 SD = 8.51 SEM= 4.25	89.4 SD = 13.13 SEM= 6.56	100.0 SD = 0.00 SEM= .00	90.6 SD = 5.54 SEM= 2.77	85.6 SD = 3.75 SEM= 1.88	93.8 SD = 9.24 SEM= 4.62	92.2

L1 = first language speakers of English.

L2 = second language speakers of English with IELTS equivalences of 6.5 +.

The test results for the tests used in Study 5 show that the case study participants, 901 – 904, did not perform as well overall as the mean of the L1 group – either individually or as a group. The results for 904 are lower than those of 901 – 903; however, the mean overall results for 901 – 904 are fairly similar to those of the original L2 participants. Participant 904's mean accuracy rates were around 10% lower than the mean rate for the original L2 group; however, in Section 4, her performance was L1-like.

We again analysed the mean differences between the L1 group and the group of four case study participants ($N = 4$), and then separately analysed the mean differences between the L1 group and the higher performing 901 – 903 ($N = 3$). The results are shown below in Table 5. $N = 40$ for the L1 group.

Table 5. Mean differences between the results of the L1 group in Study 5 and the results of the case study participants in Study 6. Results shown in % with standard errors of the mean and Cohen's d size effects. N.B. d could not be calculated for section 4.

Mean difference between:	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
	Pronoun plus 've	Pronoun plus 'd	Pronoun plus 'll	Pronoun plus 's	Modal verb plus 've	Mixed past tenses and past modals	Modal verb plus 've (+ nonce verb)
	(have)	(would/had)	(will)	(has)	(have)	(they walked, they've walked, they'd walked, they'd 've walked)	(have)
L1 group and the case study group	3.6 ^{ns} SEM= 3.21 d = .68	5.6 ^{ns} SEM= 4.28 d = .87	9.3 ^{ns} SEM= 6.58 d = .99	0.6* SEM= .23 d = xxx	8.3 ^{ns} SEM= 2.80 d = 1.93	12.4** SEM= 1.92 d = 3.83	4.2 ^{ns} SEM= 4.73 d = .52
L1 group and the case study group excluding Participant 904	0.6 ^{ns} SEM= 1.78 d = .17	1.7 ^{ns} SEM= 2.26 d = .48	2.9 ^{ns} SEM= 1.71 d = 1.10	0.6* SEM= .23 d = xxx	7.3 ^{ns} SEM = 3.65 d = 1.50	11.3* SEM= 2.24 d = 3.54	0.4 ^{ns} SEM= 1.34 d = .08

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level.

^{ns} p > .05.

In Section 4, the Study 6 participants in fact outperformed the mean of the L1 participants. In all other sections, the means of the Study 6 participants are lower than the means for the L1 participants, but the mean differences are only significant for Section 6. However, effect sizes are large in Sections 2, 3, 5 and 6, and medium in Sections 1 and 7 when comparing the means of the four participants with the L1 participants. When comparing the means of just the three stronger participants, effect sizes are still large for Sections 3, 5 and 6, but medium for Section 2.

Overall, Participants 901 – 904 performed better in the tests from Study 5, where the sentences were repetitive, than they did in the tests from Studies 1 (inflected past tense morphemes) and 2 (which also tested clitics) where all the sentences were unique. It would seem that all four participants were better able to hear the presence or absence of the functional morphemes when the cognitive load associated with processing the meaning of the sentences was reduced.

Section 6 was of particular interest since this involved identification of the morphemes in addition to recognition of their presence or absence. The L1 group seemed relatively unaffected by the additional identification task. However, Participants 901 and 903 performed worst in this section. Participant 902 performed relatively poorly in Section 6 although better in this section than in Section 5. Participant 904 actually performed better in this section than in Sections 2, 3 and 7. The mean difference was found to be significant between the L1 group and the case study group and the effect size was very large for the whole group and for the group where 904 was excluded.

The nonce verbs in the Section 7 tests did not noticeably distract any of the participants – neither the original ones nor the cases study ones from Study 6.

3.4.iv. *Preliminary test outcome*

From the results for all the tests, the overall picture that emerged for the Study 6 participants was that Participants 901, 902 and 903 performed better overall than the L2 listeners from the original groups in the previous studies (1,2,3 & 5) did on average, but they did not perform as well as the L1 listeners.

Participant 904 performed worse on average than the L2 participants from the previous studies whose English language levels were equivalent to IELTS 6.5 and above. This was

despite her language level being equivalent to IELTS 7.0. She particularly struggled to recognise the presence or absence of the regular past tense verb endings in Study 1.

Given the differences between the L1 listeners and the Study 6 participants, the four Study 6 participants demonstrated some deficit in their ability to recognise functional morphemes accurately. There was therefore merit in proceeding with the study to investigate whether the participants would also show a deficit in reproducing auditory sentences, even though they would have time to monitor the grammar of the sentences as they reconstructed them.

3.5 Part 1 of the study: the initial test – sentence dictations

With the sentence dictation test, we aimed to investigate how well the participants could listen to a sentence and reproduce it accurately, despite not recognising all the functional morphemes. Such a task involves listeners mentally re-constructing the surface structure of the sentence they have listened to before, or while, reproducing it. Although listeners might not have attended to some of the functional morphemes in the sentence, we anticipated that top-down processing involving the use of knowledge of grammar and language would act as a filter to allow a reproduction of sentences.

3.5.i. *Methods for the sentence dictations*

Materials and materials design

To remain in keeping with the previous studies, the sentences in Study 6 focused on the use of verbs in the past tense, the use of the perfect aspect (present perfect and past perfect), and on auxiliary verbs and modal verbs. Different sentence types and lengths

were included and were mixed so that no particular pattern of type or length should occur.

A number of the sentences expressed situations in the past where past actions or states were contingent on certain conditions being met (also referred to as complex third conditional types of sentence, or simply '3rd conditionals'). Such sentences are expressed through modal verbs and primary auxiliary verbs in English (e.g. If you *had* left the book here, I *would have* borrowed it). These '3rd conditionals' were of particular interest for four reasons.

1. In relation to structure: in connected speech such sentences usually contain at least three reduced auxiliary or modal verbs plus at least two verbs in their past participle form – for regular verbs the past participle form is the same as the past tense form, that is there is an inflected –ed ending suffixed to the verb.
2. Such sentences are complex, but little has been written in psycholinguistic literature as to how L2 listeners process complex 3rd conditional sentences.
3. As discussed in Chapter 1, modality is expressed differently across languages; English particularly uses modal verbs in syntactic structures to express modality but, in Russian for example, the modal system is not as grammaticalized as the English system and modality is more a semantic category than a syntactic one (de Haan, 2002).
4. Many L2 speakers seem not to produce this type of sentence with ease when speaking, nor with accuracy.

Thirty-three sentences were created, which included a mix of simple and complex sentences presented in a random order. The sentences were spoken by a female, adult L1 English speaker from the south-east of England with a fairly standard accent, and recordings were made. The full set of sentences are included in Appendix 2a.

A sample of the sentences is given here:

- *We have always started at 8 am.*
- *We have obtained some results that show the theory to be valid.*
- *If you had left the book here, I would have borrowed it.*
- *I would have helped if you had asked me to.*
- *Where have you put my book?*
- *Would you have done anything differently if you had had more help?*
- *Where did you say you had asked her to meet you?*
- *You have only visited me twice.*
- *If he had read the book first, he wouldn't have enjoyed the film.*

The sentences were spoken with the co-articulation that would occur in naturally occurring speech. Thus, the first sentence was articulated as,

/wi: v ɔ:l weɪs stɑ:.tɪ.dæ.teɪ.teɪ.em/

(we-vawl-ways star-ti da-teigh-tay-em)

and the third sentence as,

/ɪf ju:.dlɛf.ðə bʊ.khɪə aɪ.dəv bɔ.rəʊ.dɪt/

(if-few-dlef-the boo-khere, I-d/əv/ bor-row-dit)

(The dashes represent the syllable breaks in the sentences in italics to demonstrate how re-syllabification occurs.)

Of particular interest were the participants' abilities to recognise

- the auxiliary verb *have* reduced to -ve
- the auxiliary verb *had* reduced to -d
- the modal verb *would* reduced to -d

- the ability of the participants to reproduce the past conditional sentence (3rd conditional), wherein the main clause included a modal verb, the auxiliary verb *have* plus a content verb, and the 'if' conditional clause included the past perfect with *had* auxiliary plus content verb.

In total, the sentences included:

21 x *have* reductions

16 x *had* reductions

6 x *would* reductions

12 x 'third conditional structures', that is:

if + subject + had/hadn't + verb , subject + modal verb + have auxiliary + verb

e.g: a) *If you had left the book here, I would have read it.*

b) *If you hadn't left the book here, I wouldn't have read it.*

OR: if + subject + had/hadn't + verb , modal verb + subject + have auxiliary + verb

e.g: c) *If I had left the book here, would you have read it?*

(In examples a. and c., the implication is that the book was not left and I (in a.) or you (in b.) did not read it; in example b, the implication is that the book was left and I read it.)

It should be noted that:

- Some conditional sentences included other modal verbs than *would* – e.g. *could*, *might*
- Some conditional sentences started with the main clause, others with the 'if' clause

- The modal verb *would* presented as a question (*Would you ...?*) or as a negative (*wouldn't*) was not included among the six *would* reductions, since *would* was not reduced when articulated in these conditions
- *had* was not included among the sixteen *had* reductions if it was used as a content verb, even if it was reduced – the count of 16 only included the functional morpheme auxiliary verb *had*.

Procedure

The sentences were presented to the participants in two sets. A set of twelve sentences was presented first in order to understand how the participants would be able to manage the task. Although the participants were not able to 'catch' everything that was said in all the sentences, they were happy to carry on with the second set of twenty-one sentences.

Participants 901, 903 and 904 were tested together as one group. Participant 902 was not able to join the group for the test and therefore took the test by herself a few days later.

The nature of the test was explained to the participants, and so they were aware that they would only hear each sentence once but they would not be put under time pressure – that is, the next sentence would not be played until they had finished writing the current one and they could ask for a break at any time if required. They were also informed that they could write the functional morphemes in full or as reductions, as preferred, and that spelling was not an issue as long as the words and morphemes could be understood. The experimenter included short 'chat breaks' of one to two minutes to avoid mental fatigue or loss of attention – one was included in the first set of twelve sentences, and there were two in the second set of twenty-one sentences. There was additionally a short break between the sets of sentences.

/v/, /w/, /b/ - 12 more sentences

A further set of twelve sentences was also administered during the test session. These twelve sentences focused on the participants' abilities to discriminate between /v/ and /w/ and between /v/ and /b/, thus the participants were in fact given forty-five sentences in the initial test session. The focus of this third set was particular to this group of participants due to their L1s – in Russian there is a lack of discrimination between [v] and [w], and in Portuguese there is a lack of discrimination between [v] and [b]. The participants had previously discussed these difficulties and were interested in being tested on their abilities in this respect in the initial test. Therefore, the twelve sentences in this third set used the nonce verb *vuff*, which had been trialled in Study 4, along with *wuff* and *buff*, which are low-frequency words, and differed only from each other and from *vuff* in their initial sound.

This set included a range of sentences that were similar to those in the other two sets of sentences. However, poor results indicated that the participants were distracted by attempting to discriminate the initial sounds of the verbs. Although the results for these sentences were discussed with the participants, they have not been included in this study.

3.5.ii. *Results*

Table 6 below shows the results of the case study participants, Participants 901 - 904.

Table 6. Number of correct identifications; and number of sentences with missing content words (nouns, pronouns, verbs). Initial pre-training test.

Partici- pant	No. of correct sentences	No. of sentences with missing content words	Correct identi- fication of 'd (had)	Correct identi- fication of 'd (would)	Correct identi- fication of 've (have)	Correct structure given for 3 rd cond- itional sentence	Of the correct 3 rd conditional structures, X were non- standard
	<i>Out of 33</i>	<i>Out of 33</i>	<i>Out of 16</i>	<i>Out of 6</i>	<i>Out of 21</i>	<i>Out of 12</i>	
901	13	9	6	4	13	3	0
902	13	1	6	3	18	2	1 out of 2
903	15	0	3	2	16	0	0
904	7	9	2	5	14	0	0

Correct sentences

A sentence was counted as incorrect if words were missing or misidentified, or an incorrect grammatical structure or tense was used. The first column of results shows that none of the participants were able to produce even half the sentences correctly.

Participant 901 produced 13/33 sentences accurately.

Participant 902 produced 13/33 sentences accurately.

Participant 903 produced 15/33 sentences accurately.

Participant 904 produced 7/33 sentences accurately.

Missing content words

Second column of results: Participants 901 and 904 each had nine sentences wherein content words were missing and the sentences were thus incomplete. Participants 902 and 903 did not seem to have the same problem.

We included this count as we did not know whether there would be errors of missing content words in addition to issues of missing functional morphemes. We included pronouns as content words, since a missing pronoun entailed either a missing agent or a missing patient in the sentence.

We did not include words that were misheard in this count, for example where *rent* was written instead of *read*, nor did we include missing function words nor missing functional morphemes; we simply counted the number of sentences that were incomplete in terms of content words or pronouns.

Reductions of auxiliary and modal verbs: had, would, have

The results additionally show that the four participants underperformed in correctly identifying the auxiliary and modal verbs *had*, *would* and *have* when these were presented in reduced forms as clitics.

3rd conditional structures

The sixth column shows that the participants had problems identifying and reproducing 3rd conditional structures.

Participant 901 reproduced 3 out of 12 correctly.

Participant 902 reproduced 2 out of 12 correctly.

Participants 903 and 904 did not reproduce any correctly.

Non-standard '3rd conditional structures'

Recently, two non-standard versions of a '3rd conditional' surface form of sentence structure have started to be used in British English, as follows:

- Examples of non-standard structures:
- i) *Would you have read the book if I **would have** lent it to you?*
 - ii) *Would you have read the book if I **had have** lent it to you?*

The standard structure spoken in the test:

*Would you have read the book if I **had** lent it to you?*

We decided to accept the non-standard versions provided they were written correctly as above. In such cases, we have counted them as a correct 3rd conditional structure. Additionally, provided all the other words in the sentence were accurate, they were also counted as a correct sentence. We have, however, noted in the right-hand column in Table 4 (and in subsequent tables) how many of the correct 3rd conditional sentences were non-standard ones. In relation to the four case study participants, this was only relevant to one participant (903) on one occasion. However, the non-standard variation is particularly relevant to the participants in the sentence validation group, presented later.

Using knowledge of grammar to produce grammatically accurate sentences

The participants were given time in the tests to think about their sentences and thus to draw on their knowledge of grammar to produce complete and accurate sentences. However, as the results show, the participants seemed to have a deficit in this respect.

Given the results for the case study participants (901 – 904), we wondered whether the sentence dictation task had been unreasonably difficult. For this reason, we decided to verify the validity of the task by asking L1 speakers of English to take the same test.

3.6 Part 1 of the study: validation of the sentence dictation task

3.6.i. Sentence-dictation validation test: Methods

Participants

The sentence-validation participants were recruited through a credit-reward system at their university, and this allowed us to recruit a number of L1 English speakers together with a few additional L2 English speakers. We accepted all the participants who volunteered to take part and therefore did not control the profile of the L2 volunteers. Thirty-one undergraduate students agreed to participate in the sentence-validation task and were rewarded with course credits. Participants were tested in several groups depending on their availability. Twenty-six were L1 speakers of English, the remaining five were L2 speakers of English.

Table 7. The 31 validation participants in Study 6.

English as L1 or L2	First languages	Age groups	Gender	Stage of study	Time in the UK	English levels for L2 participants in IELTS equivalences
L1 N = 26	English	18-21 x 23 (f) 18-23 x 1 (m) 22-25 x 1 (f) 36-55 x 1 (f)	female x 25 male x 1	undergraduate	n/a	n/a
L2 N = 5	Cantonese German Greek Hindi Romanian	18-21 x 5	female x 5	undergraduate	1 year 1 year 1 month 1 month 2 months	7.0 8.5 7.0 7.5 8.0

Materials and procedure

Participants in the validation group were administered the sentence dictations from the first two sets of the initial test (that is, 33 sentences); moreover, during the same testing session, the validation group was also administered the sentence dictations from the final test. Thus, participants in the validation group listened to, and wrote down, seventy-eight sentences in a sixty-minute testing session. Some participants listened to the 33 initial test sentences first followed by the 45 final test sentences; other participants started with sentences from the final test.

The experimenter who had administered the tests to the case study participants (Participants 901 – 904) also administered the sentence dictation tests to the validation group. The procedure was the same for both sets of groups, except that the participants in the validation group processed all seventy-eight sentences within the one-hour session.

Results

It should be noted that a sentence was counted as incorrect if the tense had been changed, e.g. if the present perfect tense or the past perfect tense was written as the past simple tense, even though in a number of sentences, this change of tense made no difference to the meaning of the sentence. The predominant error of the L1 group was writing the present perfect or past perfect tenses as past tenses. Since the number of correct sentences refers to those that matched the surface form of the original sentence, and not to those that matched the meaning, the count for Participants 601 – 631 is lower than it would have been if we had accepted the past simple tense instead of requiring the present or past perfect tenses. Consequently, only one L1 participant reproduced all 33 sentences exactly as they had been said.

<i>Number of correctly produced sentences</i>	<i>by</i>	<i>Number of L1 participants</i>
33		1
32		1
31		3
30		2
29		2
28		2
21 – 27		15

A few errors were due to pronoun changes, although this was a small issue for L1 listeners. For L2 listeners, pronoun changes was a greater issue.

Missing content words: In the main, L1 listeners did not produce sentences with missing content words. On a rare occasion, they substituted a word, such as *dates* instead of *data*, but the sentences still made sense. Only three participants missed out a content word or pronoun, and only in one sentence each.

Reductions of had, would, have: All L1 participants, apart from two, missed reductions of the auxiliary verb *had* used to denote the past perfect. Moreover, in contrast to the L2 listeners, L1 listeners did not misidentify the reduced *-d (had)* as the reduced *-ve (have)*.

There was only one missed reduction of ‘would’ among all the L1 participants.

Both L1 and L2 listeners missed reductions of the auxiliary verb *have* in present perfect structures (e.g. *we’ve obtained* being written as *we obtained*) rather than in modal verb structures (e.g. *I’d ‘ve borrowed it*). In contrast, the case study participants (901 – 904) missed the ‘ve morpheme in both types of structure. (The exception was L1 Participant 609, whose errors included missing morphemes and also misidentifying *have* as *had*.)

Third conditional structures: Eight of the L1 participants gave correct structures for all 12 of the 3rd conditional structures; however, four of the eight included 1 non-standard

structure, one included 2 non-standard structures, and two included 3 or 4 non-standard structures respectively. Only one of the eight wrote all 12 structures in the standard way.

In total, half the L1 participants (13/26) reproduced at least one 3rd conditional sentence with a non-standard but acceptable structure. This seemed to occur more frequently (but not exclusively) when the 'if clause' (the condition clause) was presented as the second clause rather than as the first clause, possibly indicating more attention was paid to the structure of the first clause than to the second. To compare the issue across the groups, we found:

- The L1 group produced 21 non-standard 3rd conditional structures out of 312 (312 = 12 structures X 26 people) = **6.73%**. One person produced four of the 21 structures, one person produced three, and the other 11 people produced only one or two each.
- One person in the L2 group did not produce a non-standard structure, but the other four together produced 11, which equates to **18.33%** for the group.
- There was only one non-standard 3rd conditional structure among the case study participants, which equates to **2.08%**.

Third conditional errors: The majority of errors made by the sentence validation group, both L1 and L2, in relation to the 3rd conditional structures, was a missing past perfect in the if clause (e.g. *If you left the book here, I'd have borrowed it* instead of *If you had (or 'you'd) left the book here, I'd have borrowed it*. We considered allowing this as 'correct', but in fact, none of the participants used the past simple tense instead of the past perfect tense consistently in these structures. We are in no doubt that these written errors did not reflect a misunderstanding of the meaning of the sentences; nevertheless, we have counted them as an incorrect 3rd conditional structure. The reason for not accepting the past tense as correct is because this is used in the 2nd conditional as a subjunctive form, denoting either a possibility in the present or future, or a speculation about irrealis in the present or the future (e.g. *If it snowed tomorrow, I would go skiing*, or *If they owned an*

aeroplane, they could fly up and down the country – what a shame they do not have a plane.) This in fact constituted a ‘triple whammy’, since we counted this error as a missing reduction of *had*, as an incorrect 3rd conditional structure and, consequently, as an incorrect sentence.

In terms of 3rd conditional structure errors among the validation group participants, the L2 exceptions was Participant 606, who frequently wrote *have* instead of *had*; and the L1 exception was Participant 609, who wrote *would had* instead of *would have* on a number of occasions in the main clause.

Sentence order: Since testing of the validation group participants happened in a random order, we could not know in advance in which order the different participants would be given the sentences. The results showed that all the L2 validation participants listened to the sentences in the same order as the case study participants. It was only L1 participants who listened to sentences in different orders. To analyse whether sentence order made a difference between the L1 groups who heard the sentences in two different orders, an independent samples t-test was conducted. This showed that there was no significant difference between the two L1 groups.

The results from the validation group are presented with the results from the case study participants in Tables 8 and 9 below for purposes of comparison.

Table 8. Results for the 33 sentences used in the **initial pre-training** test. Number of correct identifications; and number of sentences with missing content words (nouns, pronouns, verbs). Results given in numbers.

Partici- pant	No. of correct sentences	No. of sentences with missing content words	Correct identi- fication of 'd (had)	Correct identi- fication of 'd (would)	Correct identi- fication of 've (have)	Correct structure given for 3 rd cond- itional sentence	Of the correct 3 rd conditional structures, X were non- standard
	<i>Out of 33</i>	<i>Out of 33</i>	<i>Out of 16</i>	<i>Out of 6</i>	<i>Out of 21</i>	<i>Out of 12</i>	
901	13	9	6	4	13	3	0
902	13	1	6	3	18	2	1 out of 2
903	15	0	3	2	16	0	0
904	7	9	2	5	14	0	0
							1 in total /4 participants
L1 N = 26	26.88	0.1	13.3	6.0	19.7	9.9	21 in total /26 particip.
L2 N = 5	18.6	1.4	6.0	5.6	19.2	7.8	11 in total /5 particip.

Table 9. Results for the 33 initial pre-training test sentences. Mean results for the three groups: L1 validation, L2 validation and L6 case study participants. Mean differences between the L1 group and the L6 group. Results shown in % and given with standard deviations and standard errors of the mean. *d* = Cohen's *D* effect size.

Group	No. of correct sentences including non-standard 3 rd conditionals	No. of sentences with missing content words	Correct identification of 'd (had)	Correct identification of 'd (would)	Correct identification of 've (have)	Correct structure given for 3 rd conditional sentence
	<i>Out of 33</i>	<i>Out of 33</i>	<i>Out of 16</i>	<i>Out of 6</i>	<i>Out of 21</i>	<i>Out of 12</i>
L1 N = 26	81.5 SD = 10.54 SEM= 2.06	0.35 SD = .99 SEM = .19	82.9 SD = 14.74 SEM = 2.89	99.4 SD = 3.27 SEM = .64	93.6 SD = 6.59 SEM = 1.29	82.1 SD = 18.66 SEM = 3.66
L2 N = 5	56.4 SD = 13.32 SEM= 5.95	4.2 SD = 5.07 SEM = 2.27	37.5 SD = 19.26 SEM = 8.62	93.3 SD = 14.91 SEM = 6.67	91.4 SD = 2.13 SEM = .95	65.0 SD = 34.05 SEM = 15.23
L6 N = 4	36.4 SD = 10.50 SEM= 5.25	14.4 SD = 14.92 SEM = 7.46	26.6 SD = 12.88 SEM = 6.44	58.3 SD = 21.52 SEM = 10.76	72.6 SD = 10.56 SEM = 5.28	10.4 SD = 12.50 SEM = 6.25
Mean diff: L1 – L6	45.1*** SEM= 5.64 <i>d</i> = 4.29	14.0 ^{ns} SEM= 7.46 <i>d</i> = 1.33	56.4*** SEM= 7.06 <i>d</i> = 4.07	41.0* SEM= 10.78 <i>d</i> = 2.67	20.0* SEM= 5.40 <i>d</i> = 2.39	71.6*** SEM= 7.24 <i>d</i> = 4.51

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level.

^{ns} *p* > .05.

Although the L1 validation group made a number of errors, the results show that their mean level of performances were high. The predominant error was omission of the reduced auxiliary verb *had* in past perfect tense structures. The second most common error was omission of the reduced auxiliary verb *have* in present perfect structures. A

much smaller third issue was pronoun changes, most of which were changing *he* to *you*. This then sets a benchmark for approximate levels of accuracy that could be considered as L1-like proficiency.

The mean differences between the L1 validation group and the L6 case study participants showed that L6 group had performed at a considerably and significantly lower level than the L1 group. These results motivated us to proceed to the second part of the study, the training, to investigate whether training could improve the processing abilities of the four case study participants.

3.7 Part 2 of the study: training

3.7.i. Training considerations

Training was not aligned to any particular approach. A small amount of explicit form-focused instruction was given at the outset to ensure that participants understood both the form and the function of 3rd conditional grammatical constructions. Some initial form-focused attention was drawn to the modifications of relevant functors due to co-articulation.

Studies by a number of researchers have suggested that, in the L1, the acquisition of morpho-syntax is driven by frequent and consistent input which leads to representation entrenchment (e.g. Bybee, 2006; Tomasello, 2003 & 2009). This approach has also been trialled successfully in L2 research by Deng, Dunlap & Chen (2017), although their study was based on visual input rather than auditory. Therefore, relevant linguistic elements were repeated frequently and across a range of contexts in order for grammatical constructions, together with reductions in functors and other elements of co-articulation, to facilitate implicit noticing.

Three considerations guided the development of the training sessions and supported the choice to focus on noticing linguistic elements repeatedly across contexts:

1. The participants' general English language levels ranged from advanced to proficient, and they had all engaged in years' worth of general English language study. The training sessions needed to focus predominantly on listening to, and noticing, input rather than on general language development.
2. The participants had all been resident in the UK for a while (901 - 9 years, 902 and 903 - 5 years each, and 904 - 18 months) and had thus been exposed to English in their daily lives for a considerable period of time. They worked at a university in the UK and interacted with L1 English speaking colleagues and students on a regular and consistent basis. Exposure to spoken language in the target country was not enabling them to become proficient in listening. Therefore, the training sessions needed to make the participants aware of functors and chosen grammatical constructions within auditory streams of connected speech, and to do this repeatedly to facilitate entrenchment.
3. The training needed to provide context for the functors and chosen grammatical constructions at word boundary level, at sentence level, and at semantic level so the participants could be exposed to the functional morphemes repeatedly in different linguistic and semantic contexts. Thus, they would be exposed both to form and related function.

In agreement with the participants, it was decided that training would take place once per week over a ten-week period. The duration of each period was one hour. Participants were happy to make this commitment and, as mentioned previously, were motivated by the opportunity to develop their listening skills and by interest in the research project, since they, themselves, were also researchers.

3.7.ii. *Methods for the training sessions*

Materials and materials design

In order to satisfy the three conditions above, it was determined that the training sessions should involve explicit training in grammar of third conditional structures at the beginning of the training programme to ensure participants had understood its function and had practised producing the structure. The participants' levels of English were advanced and they had previously received explicit training in this structure, so the explicit form-focused and form-meaning instruction and practice at the beginning of the training programme was more of a re-training and reminder, rather than an introduction to a previously unknown structure.

Throughout the training, the participants would be exposed to spoken sentences which included co-articulations of speech sounds. Sentences would be put together with other sentences to provide narratives of varying lengths, so that the contexts were semantically comprehensible. Thus, co-articulated sounds of functional morphemes would be presented at word boundaries, within sentences, and within semantic contexts. There would be some focus on the form of reduced functors at the initial stages.

The narratives would focus on events that had taken place in the past, or on possibilities that could have, or should have, taken place in the past. Thus verb phrases with simple past tenses, past perfect tenses, and modal verb structures expressing past possibilities (irrealis) would be included. Sentences using the present perfect tense were also included. As it was not possible to cover all aspects of co-articulation in the sessions to any greater extent, the focus was on developing the functional morphemes of relevance both from Section 6 of the Study 5 test (wherein participants attempted to discriminate between *they walked*, *they've walked*, *they'd walked* and *they'd've walked*) and from the 3rd conditional structures that had proved so difficult in the initial, pre-training, test.

Three separate sets of materials were included.

1. Two sheets of explanations with exercises in written form, which were discussed and practised orally. These were used as a reminder of the form and function of third conditional sentences at the beginning of the first session. The materials were bespoke and written by the researcher.

2. A bespoke set of materials were created to satisfy the conditions mentioned above. Fifteen sheets of sentences were written specifically for the training sessions. Each sheet comprised eighteen sets of sentences, with some sets comprising a single sentence of various lengths, but some including two or even three sentences.

The sentences were read aloud by adult native British English speakers and recorded so that the recordings could be played during the training sessions. Seven speakers were involved, three males and four females, so that the participants could hear a variety of speakers articulating various morphemes.

3. Additionally, audio recordings were made of news speakers presenting news headlines on the BBC 1 TV channel. Items were transcribed to create two sheets of recordings in order to add variety. News headlines were useful for our purposes since news items are often introduced with the use of the present perfect tense before the speaker changes into the past simple tense. Modality may also be included.

The focus of the training was to enable the participants to perceive the speech sounds – often co-articulated – representing functional morphemes used to refer to real or hypothetical past tense events or situations. However, at the request of the participants, we also included a number of sentences with content words that began with /w/ or /v/ to practise the ability to discriminate between the two sounds.

Samples of sentences from the training materials:

1. *The vista from our window was wonderful.*
2. *We wished we'd (had) brought a camera.*
3. *If we'd (had) brought a camera, we'd 've (would have) taken some pictures.*
4. *The pictures would've been a lovely souvenir from our trip.*
5. *Wistfully we wished we'd (had) remembered the camera.*

.....

1. *We've concluded the study and we've analysed the results.*
2. *They said they'd (had) analysed all the results carefully.*
3. *They've discovered three anomalies.*
4. *They wouldn't 've (wouldn't have) known what to do about the anomalies if their supervisor hadn't helped them.*
5. *If he'd been away, they'd 've been stuck.*

.....

1. *"How different my life might've been if my birth parents hadn't died", Wellie thought to himself.*
2. *But he also thought about how good his life'd been with his foster family, who'd cared for him and given him an interesting life.*
3. *If his foster parents hadn't encouraged and supported him, he mightn't 've gone to university nor completed his doctorate in zoology.*
4. *And then, he'd 've missed out on the fantastic experiences he'd had in the last few years of field work in Madagascar.*
5. *He wouldn't 've been able to study the wildlife there and wouldn't 've discovered a new species of lizard.*

6. *After Wellie'd put the phone down, it took him a few minutes to locate his laptop and his glasses. He then realised that his laptop needed charging.*
7. *He'd just plugged in the charger when the phone went again.*

.....

1. *They'd rented a house to live in.*
2. *The house'd been fairly remote with no direct neighbours. One day someone from the estate agents, through whom the house'd been rented, had come by to do a spot check to see whether the tenants were looking after the house well.*

Samples of news items from the Breakfast programme on BBC1 on 21st June 2017 used for the training:

1. *There's been a major cliff fall at Seaford Head this afternoon. It happened at around 4 pm. Part of the chalk cliff face has collapsed.*
2. *It's been reported that around 50 thousand tonnes of chalk 've fallen from the cliff onto the beach, but as that section of the beach is inaccessible, nobody's been injured. Even so, a search-and- rescue operation's been launched. Beach-goers 've been advised to stay away from the area.*

The reduced articulations of *have*, *had* and *would* were mostly written in their clitic form in the training materials to draw attention to how they were articulated. In a few sentences on the first sheets, a reminder that 'd meant *had* was added in brackets, as seen in sentences 1, 4 and 5 above, since this had proved the most problematic contraction. There was also a reminder that 'd 've meant *would have*.

Further samples of the training materials are included in Appendix 2b.

Procedure

Training took place once per week for ten weeks. Each session lasted an hour.

The participants were trained together as one group. The listening input process was as follows:

First, participants listened to a sheet of 18 sets of sentences. The sentences were played right through for listening comprehension. If participants did not understand a sentence, they could ask for it to be played again and could check vocabulary.

After listening once, the participants were given the printed sheet so they could read the sentences while they listened a second time. This time the focus was on sound-visual word and morpheme recognition. Sentences, and parts of sentences, that posed difficulties were repeated. The participants were encouraged to ask about any meanings that were unclear to them. Since the training took place as a group event, queries and repetitions were also group events. The participants knew each other well and were comfortable with one another. Therefore, they did not hesitate to pose questions, ask for clarity or ask for repetitions when these were required on an individual basis.

The sentences were then played twice more during which the participants could choose whether to listen and read or merely to listen. Participants chose to do both – sometimes shadow-reading and sometimes just listening.

We worked through around three sheets in each session.

At the start of the first session, we engaged with the notes on 3rd conditional sentences. At the start of the subsequent sessions, we re-played the sentences from the previous session before starting on the new sentences. While replaying the sentences from the previous session, participants chose individually whether they wanted to shadow-read or just listen. Sometimes, when there was a sentence that proved a little difficult, one or other participant asked for it to be repeated and then chose to read that one at the same time. Whether to shadow-read was optional, apart from on the second listening.

Every attempt was made to keep the sessions relaxed and to keep the participants engaged in ways they felt were useful and comfortable.

3.8 Part 2 of the study: post-training test

Materials and procedure

The final, post-training, test, as the initial, pre-training, test, comprised sentence dictations that were administered in the same way as in the initial test.

As explained above, the case study participants were given 45 sentences in the pre-training test, although we excluded the results from 12 of the sentences. To keep conditions similar in the post-training test session, the final test also comprised 45 sentences.

The sentence validation group were tested on the validity of the post-training test sentences together with the pre-training test sentences in the one test session, where they listened to and reproduced the 78 sentences (33 and 45).

Results of the case study participants

Unfortunately, participant 901 had to withdraw from the study on health grounds before the post-training test was administered. Table 10 below shows the results of Participants 902 – 904 together with the mean result for the sentence validation group.

Table 10. Number of correct identifications - **final post-training test** sentences; and number of sentences with missing content words (nouns, pronouns, verbs). Results given in numbers.

Partici- pant	No. of correct sentences	No. of sentences with missing content words	Correct identi- fication of 'd (had)	Correct identi- fication of 'd (would)	Correct identi- fication of 've (have)	Correct structure given for 3 rd condition- al sentence	Of the correct 3 rd conditional structures, X were non- standard
	<i>Out of 45</i>	<i>Out of 45</i>	<i>Out of 26</i>	<i>Out of 8</i>	<i>Out of 30</i>	<i>Out of 19</i>	
901	-	-	-	-	-	-	
902	29	0	18	7	25	11	0
903	28	0	16	8	24	8	1 out of 8
904	18	10	10	5	20	7	0
							1 in total /3 participants
L1 N = 26	37.58	0.15	22.27	7.92	28.73	15.58	33 in total /26 partici.
L2 N = 5	28.8	0.6	15.4	7.6	28.4	13.2	15 in total /5 particip.

Apart from accuracy rates for 3rd conditional structures, we note that the results of Participants 902 and 903 are now more similar to the results of the L2 participants in the validation group. The results for Participant 904 are still considerably lower than those for the L2 validation participants.

For the L1 participants in the validation group, there were three predominant errors that led to sentences being counted as incorrect, as in the pre-test sentences:

- Present perfect verb constructions presented as past simple constructions:
e.g. *we've obtained* → *we obtained* – in most cases this actually made no difference to the meaning of the sentence.
- Past perfect verb constructions a) presented as simple past constructions -
e.g. *after he'd lost* → *after he lost*; or b) presented as present perfect constructions - e.g. *she asked whether they'd already seen the film* → *she asked whether they've already seen the film*. The overwhelming majority of errors in relation to the 3rd conditional structures for the L1 participants were past perfect constructions presented as simple past constructions.
- Pronoun changes: mostly with *he* being represented as *you*, although there were also other pronoun errors, such as *he* written as *she*, *him* as *me* or *I* as *he*.

In the main, where sentences produced by the L1 participants were counted as incorrect, they were still coherent and cohesive if not exactly the same as the original. Table 11 below shows the results in percentages and the mean difference between the three case study participants and the L1 group.

Table 11. Mean results for the three groups: L1 validation, L2 validation and L6 case study participants. 45 sentences for the final post-training test. Results shown in % and given with standard deviations and standard errors of the mean. d = Cohen's D effect size.

Group	No. of correct sentences including non-standard 3 rd conditionals	No. of sentences with missing content words	Correct identification of 'd' (had)	Correct identification of 'd' (would)	Correct identification of 've' (have)	Correct structure given for 3 rd conditional sentence
	<i>Out of 45</i>	<i>Out of 45</i>	<i>Out of 26</i>	<i>Out of 8</i>	<i>Out of 30</i>	<i>Out of 19</i>
L1 N = 26	83.5 SD = 11.51 SEM= 2.26	0.34 SD = .81 SEM = .16	85.7 SD = 16.19 SEM = 3.17	99.0 SD = 3.40 SEM = .67	95.8 SD = 7.46 SEM = 1.46	82.0 SD = 16.85 SEM = 3.31
L2 N = 5	64.0 SD = 12.90 SEM= 5.77	1.3 SD = 1.22 SEM = .54	59.2 SD = 9.65 SEM = 4.32	95.0 SD = 11.18 SEM = 5.00	94.7 SD = 5.05 SEM = 2.26	69.4 SD = 24.52 SEM = 10.96
L6 N = 3	55.6 SD = 13.51 SEM= 7.80	7.4 SD = 12.83 SEM = 7.41	56.41 SD = 16.01 SEM = 9.25	83.3 SD = 19.09 SEM = 11.02	76.7 SD = 8.82 SEM = 5.09	45.6 SD = 10.96 SEM = 6.32
Mean diff: L1 – L6	28.0 ^{ns} SEM= 8.12 d = 2.22	7.1 ^{ns} SEM= 7.41 d = .78	29.2 ^{ns} SEM= 9.78 d = 1.82	15.7 ^{ns} SEM= 11.04 d = 1.50	19.1 ^{ns} SEM= 5.30 d = 2.34	36.4* SEM= 7.14 d = 2.56

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level.

^{ns} p > .05.

Means and mean differences were analysed in SPSS version 25 using independent samples t-tests. Since we did not have results for Participant 901 in the post-training test, we re-analysed the results from the pre-test and excluded the Participant 901's pre-test results. The mean differences presented below are calculated for there being only 3 participants in the L6 group in both tests. Table 12 shows the mean differences in each test between

the L1 validation group and the L6 case study group. Levene's test for equality of variances showed variances were not assumed. Only the difference between groups in respect of 3rd conditional structures was found to be significant. This may be due to the very small number of participants in the L6 group and the large-ish variations between them. Despite not finding the differences significant, there are very large effect sizes for the differences between the groups in all respects apart from for sentences with missing content words.

Table 12. Mean differences for the pre- and post- tests between the L1 validation group (N = 26) and L6 case study participant group without Participant 901 (N = 3). Results shown in % and shown with standard errors of the mean. d = Cohen's D effect size.

Mean difference between L1 group and L6 group	No. of correct sentences including non-standard 3 rd conditionals	No. of sentences with missing content words	Correct identification of 'd' (had)	Correct identification of 'd' (would)	Correct identification of 've' (have)	Correct structure given for 3 rd conditional sentence
Initial: Pre-test	46.1* SEM= 7.57 d = 3.97	9.8 ^{ns} SEM= 8.63 d = 0.92	60.0** SEM= 8.05 d = 4.32	43.8 ^{ns} SEM= 14.71 d = 2.41	17.4 ^{ns} SEM= 5.65 d = 2.13	76.5*** SEM= 6.65 d = 5.15
Final: post-test	28.0 ^{ns} SEM= 8.12 d = 2.22	7.1 ^{ns} SEM= 7.41 d = .78	29.2 ^{ns} SEM= 9.78 d = 1.82	15.7 ^{ns} SEM= 11.04 d = 1.50	19.1 ^{ns} SEM= 5.30 d = 2.34	36.4* SEM= 7.14 d = 2.56

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} p > .05.

In respect of correct identification of the *have* reduction, we notice that the difference between the L6 group and the L1 group increased from the pre-training test to the post-training test, as did the effect size. This was due to the L1 group performing slightly better in the sentences in the final test. The L6 group, with only three participants, performed

equally in both tests, with 76.2% and 76.7% accuracy respectively. In all other categories, the mean differences and the effect sizes for the differences decreased following training. This indicates that training had an impact on the performances of the L6 group, bringing the L6 group's mean level of performance closer to the L1 group mean level of performance.

We further ran repeated measures t-tests for all three groups to compare the within-group differences between the pre-test and the post-test results, as shown in Table 13 below.

Table 13. Within group differences between the pre-training test and post-training test: L1 validation, L2 validation and L6 case study participants. Differences also shown for the three case study participants, 902 – 904. Results for the pre-test and for the post-test are given in italics above the difference between the two. Results shown in % and shown with standard deviations and standard errors of the mean. *d* = Cohen's *D* effect size.

Group	No. of correct sentences including non-standard 3 rd conditionals	No. of sentences with missing content words	Correct identification of 'd' (had)	Correct identification of 'd' (would)	Correct identification of 've' (have)	Correct structure given for 3 rd conditional sentence
Participant 901	39.4 →	27.3 →	37.5 →	66.7 →	61.9 →	25.0 →
Participant 902	39.4 → 64.4 + 25.0	3.0 → 0.0 - 3.0	37.5 → 69.2 + 31.7	50.0 → 87.5 + 37.5	85.7 → 83.3 - 2.4	16.7 → 57.9 + 38.3
Participant 903	45.5 → 62.2 + 16.8	0.0 → 0.0 0.0%	18.8 → 61.6 + 42.8	33.3 → 100.0 + 66.7	76.2 → 80.0 + 3.8	0.0% 42.1% + 42.1
Participant 904	21.2 → 40.0 + 18.8	27.3 → 22.2 - 5.1	12.5 → 38.5 + 26.0	83.3 → 62.5 - 20.8	66.7 → 66.7 0.0	0.0 → 36.8 + 36.8
L1 mean difference N = 26	81.5 → 83.5 + 2.0^{ns} SD = 8.29 SEM = 1.63 <i>d</i> = 0.24	0.35 → 0.34 - 0.01^{ns} SD = 1.37 SEM = .27 <i>d</i> = 0.007	82.9 → 85.7 + 2.8^{ns} SD = 12.72 SEM = 2.50 <i>d</i> = 0.22	99.4 → 99.0 + 0.4^{ns} SD = 4.85 SEM = .95 <i>d</i> = 0.08	93.6 → 95.8 + 2.2^{ns} SD = 5.45 SEM = 1.07 <i>d</i> = 0.40	82.05 → 82.0 - 0.05^{ns} SD = 10.58 SEM = 3.07 <i>d</i> = 0.005
L2 mean difference N = 5	56.4 → 64.0 + 7.6^{ns} SD = 6.22 SEM = 2.78 <i>d</i> = 1.22	4.2 → 1.3 - 2.9^{ns} SD = 5.28 SEM = 2.36 <i>d</i> = 0.55	37.5 → 59.2 + 21.7* SD = 14.56 SEM = 6.51 <i>d</i> = 1.49	93.3 → 95.0 + 1.7^{ns} SD = 3.73 SEM = 1.67 <i>d</i> = 0.46	91.4 → 94.7 + 3.3^{ns} SD = 5.03 SEM = 2.25 <i>d</i> = 0.65	65.0 → 69.5 + 4.5^{ns} SD = 11.56 SEM = 5.17 <i>d</i> = 0.39
L6 mean difference N = 3	35.4 → 55.6 + 20.2* SD = 4.32 SEM = 2.49 <i>d</i> = 4.68	10.1 → 7.4 - 2.7^{ns} SD = 2.54 SEM = 1.47 <i>d</i> = 1.06	22.9 → 56.4 + 33.5* SD = 8.55 SEM = 4.94 <i>d</i> = 3.89	55.6 → 83.3 + 27.7^{ns} SD = 44.56 SEM = 25.72 <i>d</i> = 0.62	76.2 → 76.7 - 0.5^{ns} SD = 3.12 SEM = 1.80 <i>d</i> = 0.16	5.6 → 45.6 + 40.0** SD = 2.82 SEM = 1.63 <i>d</i> = 14.18

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level.

^{ns} *p* > .05.

The results show that the validation group L1 listeners performed fairly consistently across the two sets of test sentences, with only very small and non-significant increases or decreases, and negligible or small effect sizes.

The validation L2 group made small and non-significant improvements in each category apart from the reduced *had* ('d) morpheme, which they heard significantly more accurately in the final test sentences. This was the only category where the mean difference was significant, and there was also a large effect size. We also found a large effect size for better performance in writing correct sentences in the post-test, which is linked to the better performance in recognising the reduced *had* morpheme.

The case study L2 Participants 902, 903 and 904 (Group L6) made considerable and significant improvements in the final test in three ways: more correct sentences, considerably more accurate identification of the reduced auxiliary verb *had* morpheme, and considerably better ability to re-produce the third conditional structure. Effect sizes in these three categories were very large. Improvements in the other elements were not significant for the group as a whole; however, we found a large effect size in the reduction of sentences with missing words – although this was mainly relevant to Participant 904. There was also a medium effect size for improvements in recognising the reduction of *would*. There was no change in the three participants' mean abilities to recognise the reduced auxiliary verb *have*; however, this ability was already fairly good in the pre-training test (76.2% accuracy).

Total correct sentences: The validation L2 participants showed a small mean increase, but the increase for the trained case study participants was much greater.

Missing content words: This was only an issue for Participants 901 and 904 and not for any of the people in the validation group. We do not have final test results for Participant 901 so we are unable to assess the effects of training on his performance in this respect.

Participant 904's performance improved by 5%, but we are not able to assess whether this was a real effect or a chance one.

Reduction of have - 've: The validation group L2 listeners performed highly; they, and the case study L2 listeners, all of whose English levels were advanced, performed fairly consistently across the two tests in their ability to recognise the reductions of *have*.

Reduction of would - 'd: The L2 validation group listeners performed highly and consistently across the two tests. The results of the case study participants were mixed with 902 and 903 increasing their performances but with 904 decreasing hers.

Reduction of had - 'd: Both sets of L2 participants had low accuracy rates in the initial test, and both sets had higher rates in the final test. However, the increase was greater for the trained participants than it was for the untrained ones.

Third conditional sentence structure: This was of particular interest. There was very little difference in the performance of the L2 validation group, nor in the performance of the L1 group, between the initial and the final test. However, the case study participants all improved considerably in their performance after training.

3.9 Chapter Discussion

1. The results of the L1 listeners in the validation group show that it is possible for listeners to reconstruct and reproduce many sentences with high rates of accuracy. In this case we asked participants to listen to, and reproduce, 78 sentences of various lengths and with various levels of complexity, and they completed the task with relatively few errors. This suggests that listeners can be expected to complete such tasks with high levels of accuracy, although perhaps not with 100% accuracy.

2. Surprisingly, given their advanced levels of English, the performance of the group L6 case study participants was lower in certain respects than that of the validation group – both the L1 and the L2 listeners. Moreover, given the accuracy rates of Participants 901, 902 and 903 in the preliminary tests from Studies 1, 2, 3 and 5, we had expected their initial test results from the sentence dictations to have been higher. This would suggest that it is difficult to predict the extent that an L2 listener is able to notice the structure of a spoken sentence. The results also show that in this case, the case study participants were not able to rely on echoic memory to replay the sentences mentally.

3. The results suggest that an L2 listener, even at advanced levels, may not be able to respond to a speaker by using the same structures as the speaker when interacting orally. This does have some implications for teaching situations, for instance when students have understood the meaning of a message but seem unable to respond with a clear or considered answer.

4. There is some suggestive evidence from the results that training, using an approach based on frequent repetition across contexts and of noticing input, improved the case study participants' performance in three ways:

- i. In overall terms of hearing sentences more accurately.
- ii. In terms of recognising the 'd' reduction as the auxiliary verb *had*. Although some of the L2 listeners in the validation group also performed better in the final test sentences than in the initial test sentences, the increase for these participants was considerably less than for the trained case study participants. The increase among the validation participants may have indicated that the 'd' reduction was easier to identify in the final test sentences; notwithstanding, the improvements of the case study participants far surpassed those of the L2 validation participants.

- iii. In terms of being able to accurately reconstruct and reproduce complex 3rd conditional sentences which express irrealis. This is particularly noteworthy for the two Russian participants, 902 and 903, for whom these grammaticalised structures do not exist in the L1.

Further to point iii. Although Participant 901 was unable to undertake the final test, he did make a noteworthy comment about three quarters of the way through the training sessions. He informed the group that, as a result of the training, he could now hear people around him using the 3rd conditional structure outside the training sessions, and that he was surprised by how often it was used by L1 English speakers. This is particularly of interest since 901 had been living and working in an English speaking environment in the UK for the previous nine years.

The decrease in accuracy shown by Participant 904 in relation to correct identification of the reduction of *would* in the final sentences was due to issues with three particular 3rd conditional sentences for which she was unable to complete the sentences, and therefore did not reproduce the *would* clause.

It is important to draw attention to the limitations of the study. First, case study participant numbers were extremely limited. Second, the L2 participants in the validation group were included by chance because they signed up for the validation group study along with the L1 participants. With the exception of Participant 606, their language levels were high. Third, there was no L2 control group who took the initial test and the final test separately and with 10 weeks between tests. It is possible that the L2 validation group increase seen in relation to the accuracy rate in recognising the reduction of 'had' was a result of priming, due to completing the final test sentence dictations at the same time as the initial test ones. All five of the L2 validation group participants ended up being given the sentences in the same order as the case study participants, therefore the final test sentences were subsequent to the initial test sentences for them. If we had had an L2

control group taking the tests separately, we would have been able to check the possibility of this effect.

3.10 Conclusion

The results of the study suggest the following conclusions:

1. Even advanced and proficient L2 speakers of English do not consistently recognise functional morphemes and this does lead to processing difficulties that affect the person's ability to reproduce the forms of the sentences. In terms of comprehension, this may or may not matter – we have not been able to test comprehension in this study. However, it does matter in terms of the person being able to engage with others fluently and competently. Being able to reproduce another person's utterances can be important in relation to conversational alignment, for instance to show comprehension or solidarity, or when the listener becomes the speaker and wants to incorporate and extend what the previous speaker has said. It also matters in the language classroom in terms of learners not being able to answer comprehension and discussion questions with extended answers, because they struggle to build on the language used by previous speakers – an ability taken for granted by L1 speakers in L1 interactions.
2. Exposure to the target language alone through immersion does not enable listeners automatically to improve their listening and processing skills in respect of accuracy.
3. Intensive training can make a difference if there is sufficient repetition of the relevant linguistic elements and the relevant grammatical constructions, and if the listeners are able to notice these and, further, to understand their role in the utterances. However, more research needs to be conducted to investigate more precisely the impact of training on listeners.

The two research questions in this study were,

1. Does a reduced ability to recognise functional morphemes in connected speech entail a reduced ability to reconstruct and reproduce spoken sentences with accuracy?
2. Is it possible to improve an L2 listener's ability to reproduce spoken sentences more accurately through training of speech-sound recognition of functional morphemes?

Based on the results, the answer to both questions is 'yes'. Our findings were that: deficits in recognising functional morphemes when listening leads to processing difficulties and thereby to errors in reconstruction and reproduction even at higher levels of L2 language proficiency; and intensive training can make a difference even at higher levels of L2 language proficiency in terms of perceptual recognition of reduced morphemes and in terms utilising the reduced morphemes in more complex grammar constructions.

Chapter 4 - Study 7

Research into whether training can have a positive effect

4.1 Introduction:

4.1.i. *Study 7 followed on from Study 6*

Following on from Study 6, the purpose with Study 7 was to further investigate whether training could affect L2 listeners' abilities to recognise functors and to process certain grammatical structures when listening.

In Study 6, there were four L2 case study participants (although one withdrew just before the final test on health grounds), and thirty-one participants (26 x L1 and 5 x L2) who tested the validity of the sentence dictation test. Results from Study 6 showed that:

- L1 listeners and some of the high-level L2 listeners were able to listen to 78 sentences of varying lengths and complexity and, immediately after hearing each sentence once only, to reproduce it accurately in written form. A few of the L1 listeners recorded hearing dialectical grammar forms rather than the standard forms that they had actually listened to, indicating that they did not always pay attention to sub-lexical cues of morpho-syntax when processing sentences. Although L1 listeners did not reproduce the surface forms of all sentences accurately, they were able to reproduce the majority of them completely accurately. This gave us a benchmark for expectations of native-like levels of accuracy in such tasks.
- Some of the L2 listeners were unable to recognise some of the grammatical content of the sentences and made errors when re-producing what had been said.

- There was some evidence that training could augment the abilities of L2 listeners to process sentences with more accuracy, particularly in respect of morpho-syntax and grammatically complex third conditional structures.

4.1.ii. *Aims and rationale*

In Study 7, similarly to Study 6, L2 participants were tested, trained, and re-tested to investigate possible improvements that training might facilitate. Study 7 was not, however, intended as an exact replication of Study 6 because we changed some of the conditions. The intention with Study 7 was to build on Study 6 by developing training methods and adding a test of comprehension. In Study 7, we aimed to intensify training and also to include a test of comprehension to explore whether L2 listeners could comprehend the function of complex third conditional structures despite deficits in morpheme recognition. The aim with this study was to address thesis research question 4, using additional techniques and a larger group of case study participants.

Research question 4: Can we find techniques to improve L2 listeners' abilities in respect of processing functors and utilizing them in sentence reconstructions?

Study 7 therefore differed from Study 6 in five follows. In Study 7:

- To obtain more robust results, there were more participants - ten L2 case study participants took part in the testing and training.
- Each participant was tested and trained individually, which allowed each person to go at their own pace, to orally practice articulating some of the sentences and examples of co-articulation, and to receive the experimenter's undivided attention. (- In Study 6 the participants were trained in one group.)

- Training materials were enhanced with additional morpheme reductions and modifications for the participants to attend to, namely, re-syllabification and linking including the insertion of the intrusive /j/, /r/ and /w/ - these aspects of co-articulation are embedded in spoken English but had not been addressed in Study 6.
- Participants were asked to repeat some of the sentences orally and thereby to re-produce morpheme modifications and reductions and also grammatical structures – this was in addition to both listening to the spoken sentences and also to reading the sentences silently while listening. This ensured that co-articulation was noticed and offered an opportunity for both repetition and rehearsal. (- In Study 6, participants did not repeat the sentences orally, they were only required to listen and then read silently while listening.) By drawing listeners' attention to the articulation of the reduced and modified morphemes in connected speech, we anticipated that listeners would achieve improved perception and recognition of sound-to-morpheme matching and retrieval.
- There were two additional sections to both the pre and post training tests: i. a morpheme recognition test; ii. a test of comprehension that investigated participants' abilities to answer comprehension questions on third conditional sentences.
- A control group was included who took the initial and final tests separately and several weeks apart.

There was an overlap in the training materials used in Studies 6 and 7. Study 7, similarly to Study 6, focused on morpho-syntactic information of real and hypothetical actions in the past, since we had previously established that L2 listeners' had particular difficulties in this respect. Therefore, the grammatical focus was on verbs and verb phrases in the past tense, present perfect tense, past perfect tense, and modal perfect 'tense', together with recognition of complex 3rd conditional sentences (*He would not have enjoyed the film if he had read the book first.*).

4.2 Participants

10 case study participants undertook the training, and 6 participants took part as control subjects without training. All participants, apart from one, were postgraduate students (Master level and Doctoral level) at two different universities in the south-east of England. The case study participant who was not a student was a visiting researcher at one of the two universities, had completed their PhD, and was a member of faculty at a university in their home country.

Table 1. Profile of the Study 7 participants

Participant	First language	Time spent in the UK	Approx. level of English communication	Started learning English at age	Age group	Gender
<i>With training</i>						
801	Creole (English) (Grenadian)	8 months	CEFR C2 - low	1 year	36 - 45	F
803	Chinese	6 months	CEFR C1 (IELTS 7.0)	12 years	36 - 45	F
804	Arabic (Iraqi)	5 years	CEFR C1 (IELTS 7.0)	11 years	36 - 45	M
805	Japanese	2 months	B2 – high (IELTS 6.5)	13 years	22 - 25	F
806	Arabic (Egyptian/Iraqi)	6 weeks	B2 – high (IELTS 6.5)	5 years	26 - 35	F
807	Thai	3 months	B2 – high (IELTS 6.5)	5 years	26 - 35	F
808	Arabic (Saudi)	1 year	B2 – high (IELTS 6.5)	13 years	22 - 25	M
809	Arabic (Saudi)	11 months	B2 – high (IELTS 6.5)	Mid 20s in the USA (little at school)	26 - 35	M
810	Korean	1 year	B2 – high (IELTS 6.5)	A year ago (and a little at school)	26 - 35	M
811	Thai	3 months	B2 – high (IELTS 6.5)	7 years	26 - 35	M
<i>Control group</i>						
813	Arabic (Saudi)	7 months	B2 – high (IELTS 6.5)	10 years	26 - 35	M
814	Spanish (Chilean)	3 years	CEFR C1	7 years	26 - 35	M
815	Bulgarian	5.5 years	CEFR C2 - low	5 years	22 - 25	M
816	Bulgarian	7 years	CEFR C2 - low	7 years	26 - 35	M
817	Turkish	1.5 years	CEFR C1	22 years	26 - 35	F
818	Chinese	5 months	B2 – high (IELTS 6.5)	9 years	26 - 35	F

Participants 801, 803, 804, 805, 806, 807, 808, 809, 810 & 811 undertook and completed the training. Two other participants, 802 and 812 started the training but did not complete it. Participants committed themselves to attending on 8 separate occasions, each lasting around 90 minutes. The first and last sessions were dedicated to the initial and final tests, the 6 sessions in between were for the training. The incentive for taking part was the training itself.

The control group comprised Participants 813, 814, 815, 816, 817 & 818. The control participants committed themselves to a 90-minute initial test session, followed 4 – 6 or 8 weeks later with another 90-minute session in which they took the final test. Participant 813 took part as a friend of one of the trained participants and in exchange for having a piece of work proofread. Participants 814 – 818 each received a payment of £25.00 to take part.

Additionally, twelve undergraduate students (nine L1 English speakers, three L2 English speakers) and one postgraduate student (L1 English speaker) took part in piloting the items to be used in Part 3 of the tests. The undergraduate students piloted the items using paper-based booklets prior to the items being set up on E-Prime, and took part for course credits; the post-graduate student piloted the E-Prime version of the test, and undertook the test as part of a research project participation exchange.

4.3 Methodology for the tests

4.3.i. Materials for the initial and final tests

The initial test comprised three parts and a self-assessment sheet. The final test was commensurate with the initial test, and thus also comprised three parts and a self-assessment sheet.

The self-assessment sheet was paper-based. Parts 1 & 2 of the tests comprised a paper-based booklet for responses and auditory recordings of sentences. Part 3 was set up on a laptop using E-Prime software and comprised visual questions and auditory recordings of sentences - one question for each sentence. The recorded items in all three parts of both the initial and the final tests were spoken by the same female, adult, L1 English speaker with a fairly standard accent from the south-east of England.

Copies of the materials that are different from the materials in Study 6 are presented in Appendix 3.

Self-assessment sheets

On the self-assessment sheets for both the initial and the final tests, the participants were asked to score their ability to understand what was being said in English (their L2) in three different scenarios: a) in lectures or talks; b) in conversations; c) in meetings with more than two people.

For each scenario, they were presented with a scale of 1 – 5 on which to rate themselves, as below:

1	2	3	4	5
a little	some things	half	most of it	everything

The initial test self-assessment sheet additionally asked participants whether they thought they had any difficulties with listening to English and, if so, what was particularly difficult.

The final test self-assessment sheet additionally asked participants whether they thought their listening abilities had changed in any ways as a result of the training they had received. The questions were presented as open-ended questions allowing participants to write whatever aspects were important for them.

Part 1 - Initial test

The aim with Part 1 was to test the participants' abilities to discriminate between the functors representing the present and past forms of the auxiliary verb *have* (*have* and *had*), and the modal verb *would*. The test from Section 6 in Study 5 was used. In this test, the items comprised the following four sentences repeated 10 times each in a random order:

- *I think they walked there*
- *I think they've walked there* (they have)
- *I think they'd walked there* (they had)
- *I think they'd 've walked there* (they would have)

The speaker pronounced the sentences with co-articulations that are usual in connected speech.

Participants were given a paper-based booklet in which to record which of the sentences they heard as they were listening. In the booklet, participants were asked to note their responses in the following way, and to write a response even if they were unsure of what they had heard:

Extract from test booklet

In this part you will hear four different sentences repeated several times. In total you will hear 40 sentences. The sentences are:

I think they walked there	
I think they've walked there	(= I think they have walked there)
I think they'd walked there	(= I think they had walked there)
I think they'd 've walked there	(= I think they would have walked there)

If you hear 'they walked',	you should write /
If you hear ' <u>they've</u> walked',	you should write v
If you hear ' <u>they'd</u> walked',	you should write d
If you hear ' <u>they'd 've</u> walked',	you should write d v

The booklet contained a sheet with the numbers 1 to 40 on which the participants could write their response next to the relevant item number after hearing each sentence.

Part 1 - Final test

Part 1 of the final test included two sections. The first section, section a, was the same test given in Part 1 of the initial test. The second section, section b, was a further test of morpheme recognition. It was constructed with the identical format to section a, but with four different sentences, also repeated in a random order:

- *I think they added more*
- *I think they've added more* (they have added)
- *I think they'd added more* (they had added)
- *I think they'd 've added more* (they would have added)

Part 2 - Initial test

The aim with part 2 was to test the participants' abilities to listen to whole sentences and to re-produce these in written form. Thus, part of the test comprised sentence dictations. Underlying this ability would be the ability to recognise words, function words and functional morphemes, and to utilise morpho-syntactic knowledge, which underpins sentence processing and retrieval. Most importantly, we were interested in the ability of participants to segment words and recognise reduced function words and functional morphemes, and also to be able to process complex 3rd conditional structures, as in Study 6.

The items in Part 2 comprised 40 individual sentences of varying lengths and complexity. The word count in each sentence varied from 6 to 15 words (or 6 to 18 syllables), with clitics being counted as two words. The total number of words was 417. The total number of syllables was 471. Clitics were counted as two separate words despite being one lexical item because sometimes auxiliary verbs and modal verbs became a clitic, and sometimes they did not. For instance, *would* was typically articulated as a clitic after a pronoun (e.g. *they'd like*) but not in a negative construction in which *not* became the clitic

(e.g. *they wouldn't like*). For consistency, we therefore counted all clitics as separate words. Moreover, participants frequently wrote clitics out in full as two words.

Included in the sentences, in a random order, were a mix of verbs and verb phrases using the past tense (e.g. *we played*), the present perfect tense (e.g. *we have played*), the past perfect tense (e.g. *we had played*), and modal verbs denoting possibilities in the past (e.g. *we would have played*). Sentence types included simple, compound and complex – the complex included 3rd conditional sentences and other forms of sentence with subordinate clauses. Some sentences were positive, some negative (negations that included *not*), and some were structured as questions. Among these sentences, we included one in the present tense and one as a 2nd conditional.

The speaker articulated the sentences with the functor reductions and other modifications that are usually made in connected speech in English.

A sample of the sentences

- *Where have you put my books?*
- *Where did you say you had asked her to meet you?*
- *I would have used the laptop if you had left it for me.*
- *We have always started at 8 am.*
- *Would you have done anything differently if you had had more help?*
- *You have only visited me twice.*
- *This should have been investigated, but we didn't have time.*
- *Why didn't you ask him for information?*
- *They would have finished their work faster if they had known what to do.*

The section of the paper-based test booklet for Part 2 contained sheets with the numbers 1 to 40. Participants were asked to write each sentence next to its item number. In the recordings of the sentences, the item number was said before each sentence was spoken.

The items from this part of the initial test had previously been tested on other participants as part of Study 6, although the items had been presented in a different order in Study 6 and mixed in with some items not included here. The suitability of the test items had

therefore been confirmed by the results from the sentence validation participants in Study 6.

Part 2 - Final test

The final test in Part 2 was similar to the initial test in Part 2. The sentences were commensurate but different. In the initial test there were 40 sentences, with a total of 417 words (471 syllables). In the final test there were 36 sentences, with a total of 423 words (496 syllables). Thus the two tests were fairly evenly balanced in terms of word count. Since we were particularly interested in participants' abilities to reproduce 3rd conditional structures following training, we included four additional 3rd conditional sentences (– in the initial test there were 16, in the final test there were 20).

Part 3 - Initial test and final test

The aim with this part was to investigate participants' abilities to understand the meaning of 3rd conditional sentences. In Part 1, we investigated whether participants could discriminate the reduced auxiliary and modal verbs that are essentially used in the construction of a 3rd conditional sentence; in Part 2, we investigated whether participants were able to re-produce 3rd conditional sentences that they had heard – in Part 3 we aimed to investigate whether participants understood the meaning of such conditional sentences.

Part 3 of the test was set up on a laptop using E-Prime software. First 64, 3rd conditional sentences were written (Set A). A comprehension question was written for each of the 64 sentences in the set. The questions were input into E-Prime as visual stimuli, and the matching sentences as auditory stimuli. Thus, for each of the 64 items, a question appeared on the screen and, 5 seconds later, the participant heard the sentence. Using the information from the sentence, the participant was then able to answer 'yes' or 'no' to the question on the screen.

3rd conditional sentences comprise two clauses, an 'if' clause and a 'would' clause (the main clause). In Part 3, the 3rd conditional sentences were structured as follows below.

'Negative', means that the clause includes the word *not*, i.e. *hadn't* or *wouldn't*.

- | | |
|---|-----|
| a) If clause followed by would clause. Both clauses positive. | X 8 |
| items. | |
| b) If clause followed by would clause. If clause positive, would clause negative. | X 8 |
| items. | |
| c) If clause followed by would clause. If clause negative, would clause positive. | X 8 |
| items. | |
| d) If clause followed by would clause. Both clauses negative. | X 8 |
| items. | |
| e) Would clause followed by if clause. Both clauses positive. | X 8 |
| items. | |
| f) Would clause followed by if clause. If clause positive, would clause negative. | X 8 |
| items. | |
| g) Would clause followed by if clause. If clause negative, would clause positive. | X 8 |
| items. | |
| h) Would clause followed by if clause. Both clauses negative. | X 8 |
| items. | |

For each structure (a – h) we produced 8 items, with 4 of the questions being directed at the 'if' clause, and 4 being directed at the 'would' clause. Thus, 32 of the 64 questions were pertinent to the information in the 'if' clause and 32 were pertinent to the information in the 'would' clause.

A sample of the items - sentences and questions

- | | | |
|---|--|-------------------------|
| - | <i>If the café had been open, she would have bought a cup of coffee.</i> | (a. above) |
| | <i>Was the café open?</i> | (if-clause question) |
| - | <i>If she hadn't slept well last night, she wouldn't have come to work this morning.</i> | (d. above) |
| | <i>Did she come to work this morning?</i> | (would-clause question) |

- *If the film had been boring, we would have left the cinema before it ended.* (a. above)
Did we leave the cinema before the film ended? (would-clause question)
- *I would have gone to the beach yesterday if it had been warm and sunny.* (e. above)
Was it warm and sunny yesterday? (if-clause question)
- *She would have cooked dinner for her friends yesterday if they hadn't been so late.* (g. above)
Did she cook dinner for her friends yesterday? (would-clause question)

As in Parts 1 & 2, the speaker articulated the sentences with the functor reductions and other modifications that are usually made in connected speech in English.

A second set of commensurate sentences and questions was then created, Set B. Thus we had a set for the initial test and a set for the final test. It should be noted that some participants started with Set A in the initial test and received Set B in the final test, but others started with Set B and finished with Set A. (The intention was for half the participants to start with Set B, but we ended up with fewer participants than expected, and therefore the distribution was a little skewed.)

4.3.ii. *Part 3 – pilot study*

Prior to Set B being created, we conducted a pilot test of the questions and answers in Set A. A paper response booklet version of Set A was created, so that we could administer the test to a pilot study group to assess the suitability and application of this type of test, and to assess whether any of the items were problematic for the test-takers in the pilot study.

Twelve people took part together in the pilot study group. They listened to the recordings of the sentences (the same recordings used in the E-Prime test), after reading the questions in their paper-based response booklet.

The response booklet included the question and three possible responses for each sentence. Participants were asked to circle the correct response to each question ('yes', 'no', 'don't know') after listening to each sentence.

A sample of the paper booklet version for the pilot study

1. Was the café open?	Yes	No	Don't know
2. Did she come to work this morning?	Yes	No	Don't know

A thirteenth participant took part separately in the pilot study. He was given the E-Prime version of Set A and completed the test individually.

Based on the results of the twelve participants who took part in the paper-based pilot study, and the participant who took part in the E-Prime pilot study, the test was deemed appropriate for the case study participants. The results from the test to pilot the items are shown below. The column for 'Type of error' gives the item number of the error to show that participants made errors on different items; e- indicates that the response was yes or no, but wrong; dk- indicates that the participant did not know the answer to the question. The 'Type of test' column shows whether the participant took the paper-based test or the E-Prime test.

Table 2. Results from the pilot study of Part 3 items (3rd conditional sentence comprehension)

Participant number	Nationality	1 st language	Total no. of correct responses	% of correct responses	Gender	Type of error – item no.	Type of test
701	British		64/64	100.00	F		PB
702	Polish	Polish	64/64	100.00	F		PB
703	British		64/64	100.00	M		PB
704	British		63/64	98.44	F	e-17	PB
705	British		64/64	100.00	F		PB
706	British		64/64	100.00	F		PB
707	British		61/64	95.31	M	e-4, dk-34,46	PB
708	UAE	Arabic	63/64	98.44	F	dk-29	PB
709	Korean	Korean/English	61/64	95.31	M	e-27,29,33	PB
710	British		62/64	96.88	M	e-19,27	PB
711	British		64/64	100.00	F		PB
712	Canadian	English (parents speak Tamil at home)	64/64	100.00	M		PB
715	British		61/64	95.31	M	e-17, dk-27,31	EP

e = error; dk = don't know; PB = paper based booklet; EP = E-Prime test

Since the pilot test was successful, Part 3 of the initial and final tests was deemed useful, and we therefore created the second set of 64 commensurate items (Set B) for Part 3. Set B, as Set A, was set up on the laptop in the E-Prime programme. Either set could be given to participants in the initial pre-training test. The other set could then be given in the final post-training test.

4.3.iii. Procedure for the initial and final tests

Participants took the tests individually, in a quiet room with the experimenter. The experimenter sat at a distance of at least two metres from the participant, so the participant knew that the experimenter could not see their answers as they were writing.

This was so that participants would not focus on whether the experimenter was judging their work. Pleasant and comfortable rooms with windows were used. The same person administered each test to each participant to ensure consistency.

Before the initial test was given, the reason for the study was explained. Participants completed a volunteer consent form, and a form with information about nationality, first and second languages, language level, time spent in the UK, gender and age group.

The procedure for the initial test and the final test was the same. Participants started with the self-assessment sheet. Parts 1, 2 and 3 were given in the same sequence to all participants. Each part was explained orally by the experimenter and participants were able to ask questions. Written instructions were included in the paper-based booklet for Part 1, moreover participants listened to examples before starting the test to ensure they understood the task and to practise hearing how the four sentences were articulated. Part 2 did not need additional instructions nor examples, since the task was for participants to listen to a sentence, then to write it down. Part 3 also included additional written instructions and two practice items at the onset.

Participants listened once only to each item in each test and were asked to write a response for each item even if they were unsure. Participants responded to each item as it was being said, or immediately afterwards, before listening to the next item.

Part 1 – morpheme recognition task. Participants listened to an item and noted down in the paper booklet whether they had heard a reduced auxiliary or modal verb, or both, and, if so, which one they had heard. As in Study 5, the four sentences were presented in a random order, but participants all listened to the sentences in the same order.

In the final test, participants listened to Section a. first, then to Section b. Instructions were given at the beginning of both sections, and examples of the items were played. In

both the initial and the final test, participants had the written examples and reminders of responses in front of them for reference. Participants were not put under time pressure, and time was allowed for participants to refer to the response guide, since the aim was to investigate accuracy rather than reaction time. Each section took between two to three minutes to complete.

Part 2 – sentence dictations. Participants wrote their sentences in the paper booklet and were asked to put a line, or leave a space, if they were aware that they had missed a word. Participants were not put under time pressure and, to avoid fatigue, participants had short breaks as necessary. Participants took between 25 to 40 minutes to complete this part.

Part 3 – E-Prime comprehension tasks. Participants completed the E-Prime test on a laptop. A question appeared on the screen and, five seconds later, participants heard a sentence. From the information in the sentence, participants were asked to answer the question by pressing 'L' on the keyboard to answer 'yes', and 'S' on the key board to answer 'no'. It was deemed that participants should use their right hand for 'yes' and their left hand for 'no', hence the 'L' and 'S' keys. If the participants did not know the answer, they had the option of pressing the space bar on the keyboard to answer 'don't know'. The L, S and space bar instructions were on a piece of paper in front of the participants for reference throughout the test. Accuracy of responses was measured, along with reaction times between the onset of the question and the response. Participants were able to control how quickly they conducted the test as they needed to press the space bar for the next item to appear; thus they were able to carry on without a pause or to take a break between items as required. The fastest participants were able to complete this part in under 20 minutes, but most participants took between 25 to 35 minutes.

4.4 Training: materials and procedure

4.4.i. *Training materials*

The training materials used in Study 7 overlapped with those used in Study 6. In Study 6, there were: 1. two grammar sheets reminding participants of the form and function of third conditional sentences with practice exercises – these were practised orally at the beginning of the first session; 2. fifteen sheets of sentences, with each sheet including eighteen sets of sentences, with some sets comprising a single sentence of various lengths, but some including two or even three sentences; 3. audio recordings of news headlines from the BBC1 Breakfast TV programme together with two sheets of transcriptions of the headlines.

In Study 7, we also included three sets of materials.

1. As in study 6, we started with two sheets of sentences which served as a reminder of the surface form and the function of third conditional sentences and offered practice exercises.
2. We reused thirteen of the fifteen sheets of sentences from Study 6, that had been written specifically for the training sessions. Each sheet comprised eighteen sets of sentences, with some sets comprising a single sentence of various lengths, but some including two or even three sentences. (The two sheets that were excluded were those that had been included at the request of the participants in Study 6 which focused on content words that began with /w/ or /v/ as they had wanted to practise the ability to discriminate between the two sounds.)

The focus of the training was to enable the participants to notice co-articulation in speech, and in particular to perceive the speech sounds – often weakly stressed – representing functors used to refer to real or hypothetical past tense events or

situations. Therefore, the sentences related to events in the past, thereby including the structures that were of interest: verbs and verb phrases using the past tenses, present perfect tenses, past perfect tenses, and modality in the past (*would/should have done*, etc) and including 3rd conditional sentences.

Samples of sentences from the training materials:

1. *After he'd finished talking to his foster mother, Wellie was in need of a drink.*
2. *He poured himself a glass of whisky and drank it down quickly.*
3. *All sorts of thoughts were running through his head, and he'd almost forgotten about his conversation with Jemima.*
4. *He'd have to contact the social workers for more information about the house where he'd been found.*
5. *If he could talk to the police too, he might find out even more information.*
6. *He hoped the police hadn't destroyed his case file. If they'd destroyed it, he might've lost whatever chance there may've been to piece his past together.*

The focus of the training was to enable the participants to notice co-articulation in speech, and to perceive the speech sounds – often weakly stressed – representing functors used to refer to real or hypothetical past tense events or situations.

The sentences related to events in the past, thereby including the structures that were of interest: verbs and verb phrases using the past tenses, present perfect tenses, past perfect tenses, and modality in the past (*would have done/should have done*, etc) and including 3rd conditional sentences. As shown, auxiliary and modal verb clitics were written in their reduced form to draw attention to how they were articulated. In a few sentences on the first sheets, a reminder that 'd meant *had* was added in brackets, since this had proved the most problematic contraction previously. There was also a reminder that 'd 've meant *would have*.

3. Instead of using recordings of news headlines, we added two bespoke sheets of sentences which additionally provided a focus on re-syllabification and linking through intrusive /j/, /r/ and /w/. This was a particularly important part of the training, since it is rarely taught in the English language teaching (ELT) classroom, and since previously participants had not known about such aspects of assimilation. While some language teachers may introduce language learners to reductions and elisions in individual words in pronunciation exercises (as, for example, that *comfortable* is pronounced as *comf-t/ə/ble*; where /ə/ is the reduced vowel sound referred to as ‘schwa’), practise of re-syllabification and intrusion is much less likely. (Sheets 16 – 17.)

All training materials were written by the experimenter and were therefore original and bespoke. The training sheets are presented in Appendix 3.

The sentences were read aloud by adult native British English speakers, using the reductions and modifications that are usual in L1 speech. Recordings were made so that the recordings could be played during the training sessions. Seven speakers were involved, three males and four females, so that the participants could hear a variety of speakers articulating various morphemes. Accents varied across speakers, with one speaker being from Wales, and the others from different regions of England, although all speakers had been living in the south-east of England for a number of years. The variety of speakers was useful to allow participants to experience slightly different pronunciations of words and clitics in connected speech.

4.4.ii. *Training procedure*

Each participant was trained individually. Training took place over 6 sessions of 90 minutes each. Some participants were able to participate twice per week, some once per week. Some participants needed to miss a week. Therefore, training lasted between four and seven weeks.

Session 1. In this session, we worked with sheets 1 – 3. Sheets 1 and 2 were about understanding and practising 3rd conditional sentences. Participants read the sheets aloud, and completed the practice sentences orally. The experimenter checked the participant's comprehension throughout through comprehension questions. Participants completed the practice sentences again in writing at home as a further practise – this was checked at the beginning of the following session. Sheet 3 involved listening to the sentences and repeating these to practice articulating the morpheme clitics. Finally, participants listened to, and repeated, the sentences on Sheet 3 without looking at the sheet. Since the last sentence set (number 18) was long and comprised two sentences, this was broken into chunks for the participant to repeat.

Sessions 2 – 6. The procedure in sessions 2 – 6 were as follows:

- i. Participants listened again to the last sheet from the previous session while shadow-reading silently
- ii. participants then listened to the sentences from the next sheet
- iii. they were then given the sheet to read silently to ensure comprehension; unfamiliar vocabulary and expressions were discussed and explained
- iv. participants listened a second time while reading the sheet again, this time shadow-reading silently
- v. participants practised reading some of the sentences aloud, with help on how to articulate the words, clitics, and relevant morphemes in connected speech – focusing on reductions, weak stresses, and elisions
- vi. participants listened to the sentences for a third time, then moved on to the next sheet of sentences
- vii. participants typically worked with two or three new sheets per session.

Sheets 4 – 13 constituted a story. The last two sheets of the story (Sheets 12 and 13) were given to the participants in the final training session – session 6. However, in sessions 4 and 5, Sheets 14 and 15 were introduced and practised in the same way as the other sheets. Through Sheets 14 and 15, participants were trained in re-syllabification and the intrusive semi-vowels /j/, /r/, and /w/. Participants continued listening to new sheets from the story in each session until, and including, session 6. At the beginning of session 6, participants listened to the previous 8 sheets of the story before starting on the final two sheets.

4.5 Results and discussion

4.5.i. *Participants' self-assessment on listening abilities: results*

Participants were asked to rate their listening abilities before and after the 6 training sessions on a scale of 1 – 5 in three different situations as follows:

- a) in lectures or talks
- b) in conversations
- c) in meetings with more than two people.

1	2	3	4	5
a little	some things	half	most of it	everything

The results are shown below in Table 3.

Table 3. Results of participants' self-assessment responses: **ratings**

Participant	Pre-training self-assessment	Post-training self-assessment
801	a) 4 b) 3 c) 3	a) 5 b) 4 c) 4
803	a) 4 b) 4 c) 3	a) 4 b) 4 c) 4
804	a) 4 b) 4 c) 4	a) 4 b) 4 c) 5
805	a) 4 b) 4 c) 4	a) 5 b) 5 c) 4
806	a) 4 b) 4 c) 3	a) 4 b) 4 c) 3
807	a) 2 b) 3 c) 3	a) 3 b) 4 c) 4
808	a) 4 b) 4 c) 4	a) 4 b) 4 c) 3
809	a) 3 b) 4 c) 3	a) 4 b) 4 c) 4
810	a) 3 b) 3 c) 3.5	a) 3.5 b) 4 c) 3.5
811	a) 2 b) 4 c) 3	a) 2 b) 4 c) 3
Control		
813	a) 4 b) 4 c) 4	
814	a) 4.5 b) 4.5 c) 4.5	
815	a) 5 b) 4 c) 5	
816	a) 5 b) 5 c) 5	
817	a) 4 b) 4 c) 4	
818	a) 2 b) 4 c) 3	

Pre-training, participants were additionally asked: “Do you think you have any difficulties when you listen in English? If so, what do you find particularly difficult?”

Post training, participants were asked: “Do you think your listening abilities have changed by taking part in the training? If so, in what ways do you think they have changed?” The trained participants' comments are tabulated in Table 4, and Table 5 shows the control group's comments.

Table 4. Results of case study participants' self-assessment responses: **comments**

Participant	Pre-training self-assessment	Post-training self-assessment
801	When people speak quickly. Sometimes, I get distracted easily. At other times, I am trying to understand what people are saying, so intensely, that some of what they say gets lost in translation.	I have learnt how to pay closer attention to speech patterns. Because of the exercises, I am better able to decipher some words, especially the endings.
803	For me, it is always hard to follow the full sentences.	Yes, it has changed. Through practice and trainer's explanations.
804	Minimal pairs *	---
805	Yes, sometimes I cannot listen tenses such as have been, would, could and so on.	Yes, when I listen native speakers' (my friends) speaking, I believe I can understand better than I did before. At the same time, I'm able to speak much better as well.
806	Sometimes, some words, when the speaker speaks quickly, but if he speaks in a loud & moderate way, I understand him.	Yes, of course. First of all, I started recognizing many words that I wasn't recognizing it before, even when I am watching English films without translation. I started understanding 70% of it.
807	Vocabulary, speed, accent.	My listening skill was improved when I listening music I can hear the word that I never noticed before ('d, 've). Moreover, if I listen and read together it very help me to hear that words easily.
808	Yes I do only with young people **	Yes, I can get most of the word from English people especially who under 20 years old!
809	When they speak fast it is difficult to understand all the speech.	Yes it improves to focus more when I hear native speak fast and improve the ability to recognize the words.
810	Yes. I have some difficulties to listen in English. When they speak long sentence, I can not find any verb and subject, even also linking word. Furthermore, when some of people speak English fast, I can not understand perfectly.	Yes, my listening abilities have changed. First of all, I can find the verb easier than the past. Moreover, I can imagine the mute sound in sentence.
811	Yes, I have problem when I listen to Academic words or specific words which I can't understand meaning clearly. I also have a problem to translate word back to my first language and I affected to my word choice when I translate the meaning back to English when I need to speak.	Yes, I've noticed contraction of the words like 'I have' 'I would'. Before that I never thought about contraction, but when I participated this research I've tried to listen to people have said and I feel like I have improved my listening skill.

*Minimal pairs are words that differ in one speech sound only, e.g. *lap* and *lab*, *sip* and *zip*, *ship* and *sheep*.

**808 explained he had difficulty understanding young people because they seemed to speak quickly and not very clearly.

Table 5. Results of control group participants' self-assessment responses: **comments**

Control		
813	People speak very quickly and don't pronounce letters/words properly, and change sounds e.g. t becomes d. They use a lot of expressions and strange words.	
814	Different accents, for example English vs Scottish accent.	
815	When people speak solely in their accent or with too many colloquialisms.	
816	Not really, although certain English accents are difficult to understand.	
817	I don't understand the idioms and some expressions because of the cultural difference. In addition, because I learned English in the U.S., accent of Britain is little bit difficult when people talk fast.	
818	Yes. I was not good at soundmark* when I was little. When I grow up I find it is difficult for me to learn it. My pronunciation is not correct, and I think this is the big problem. So, when native speaker speak too fast, it would be difficult for me. In addition, there are some simple words, I can read them, but I cannot recognise them in the listening test.	

*identifying sounds with written letters or written characters

4.5.ii. *Participants' self-assessment on listening abilities: discussion*

Reliability issues with self-assessment include memory effects and report biases. Memory effects include not only what the participant remembers, but also the degree of flexibility in participants' responses, which may be influenced by recent experiences and recent perspectives. Report biases can be due, for instance, to leading questions. Here we attempted to avoid report biases by only including open questions. However, we are aware that reporting biases could exist owing to the imprecision of the rating scale that we used here.

In the self-assessment forms, seven of the ten participants did rate their abilities more highly in at least one of the scenarios, a, b and c, after completing the training. It is possible that they recalled what they had written pre-training and deliberately scored

themselves more highly post-training; however, to reduce such an effect, their initial responses had not been discussed, and they had not seen their own ratings again since writing these several weeks earlier at the start of the initial test.

Although participant 808 did rate himself lower in scenario c in the final test, based on his comments in the comments section (and on his oral feedback during the session), we think it unlikely that he intended to score himself lower post training.

Moreover, the comments section, completed by all participants apart from 804, shows that at least nine of the participants felt their listening skills had improved. Although 804 did not write any comments, he did indicate through his ratings that his listening had improved, at least in meetings. 804 took the training and the tests during the summer vacation and did not have much contact with L1 English speakers during this time apart from in departmental meetings. This lack of his usual communication situations may have affected his responses on the self-assessment form.

Overall, taking both the ratings and the comments into consideration, it would seem that the participants considered the training to have been beneficial. They certainly all confirmed orally to the researcher throughout the training, and without prompting, that this was the case. Moreover, their willingness to complete the training and take the final test may be taken as testament to their belief in the benefits of the training.

Summary 1 – The participants considered the training to have had a positive impact on their listening abilities.

4.5.iii. Part 1 - hearing functors: results

Participants results were analysed in SPSS, version 25. Repeated measures t-tests were run for within group differences between the initial test (section a.) and the final test (sections a. and b.). There was only one section in the initial test. Independent samples t-tests were run for mean differences between the case study group and the control group. The results are shown in Table 6 below.

Table 6. Results of participants' responses in Part 1 of the initial and final tests. Differences shown together with standard deviations, standard errors of the mean, and Cohen's D (d) effect sizes.

Participant no:	First language	INITIAL TEST Correct responses: functors – they've walked <i>Part 1 – (a.)</i>	FINAL TEST Correct responses: functors – they've walked <i>Part 1 – (a.)</i>	FINAL TEST Correct responses: functors – they've added <i>Part 1 – (b.)</i>	Difference between initial test and final test, section a. in %	Difference between initial test and final test, section b. in %
801	Creole (English) (Grenadian)	30/40 = 75.0%	40/40 = 100%	40/40 = 100%	+ 25.00	+ 25.00
803	Chinese	29/40 = 72.5%	30/40 = 75.0%	37/40 = 92.5%	+ 2.50	+ 20.00
804	Arabic (Iraqi)	31/40 = 77.5%	36/40 = 90.0%	35/40 = 87.5%	+ 12.50	+ 10.00
805	Japanese	16/40 = 40.0%	31/40 = 77.5%	39/40 = 97.5%	+ 37.50	+ 57.50
806	Arabic (Egyptian/Iraqi)	27/40 = 67.5%	34/40 = 85.0%	33/40 = 82.5%	+ 17.50	+ 15.00
807	Thai	25/40 = 62.5%	31/40 = 77.5%	36/40 = 90.0%	+ 15.00	+ 27.50
808	Arabic (Saudi)	36/40 = 90.0%	39/40 = 97.5%	40/40 = 100%	+ 7.50	+ 10.00
809	Arabic (Saudi)	34/40 = 85.0%	36/40 = 90.0%	36/40 = 90.0%	+ 5.00	+ 5.00
810	Korean	14/40 = 35.0%	19/40 = 47.5%	36/40 = 90.0%	+ 12.50	+ 55.00
811	Thai	16/40 = 40.0%	21/40 = 52.5%	29/40 = 72.5%	+ 12.50	+ 32.50
<i>Group mean</i>		64.50 <i>SD= 19.71 SEM= 6.23</i>	79.25 <i>SD= 17.56 SEM= 5.44</i>	90.25 <i>SD= 8.37 SEM= 2.64</i>	+ 4.75***	+ 25.75**
813 – control	Arabic (Saudi)	30/40 = 75.0%	36/40 = 90.0%	30/40 = 75.0%	+ 15.00	0
814 – control	Spanish (Chilean)	20/40 = 50.0%	15/40 = 37.5%	25/40 = 62.5%	- 12.50	+ 12.50
815 – control	Bulgarian	40/40 = 100.0%	40/40 = 100.0%	38/40 = 95.0%	0	- 5.00
816 – control	Bulgarian	38/40 = 95.0%	34/40 = 85.0%	33/40 = 82.5%	- 10.00	- 12.50
817 – control	Turkish	37/40 = 92.5%	37/40 = 92.5%	39/40 = 97.5%	0	+ 5.00
818 – control	Chinese	30/40 = 75.0%	29/40 = 72.5%	25/40 = 62.5%	- 2.50	- 12.50
<i>Group mean</i>		81.25 <i>SD= 18.56 SEM= 7.58</i>	79.58 <i>SD= 22.55 SEM= 9.20</i>	79.17 <i>SD= 15.30 SEM= 6.25</i>	- 1.67^{ns}	- 2.08^{ns}

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} p > .05.

Within group mean differences between the initial test and the final test

Results show that the performances of the case study participants were significantly better after training:

- The mean difference between the initial test (section **a.**) and the final test (section **a.**) was **14.75%**, SD = 10.24, SEM = 3.24, $p = .001$. Cohen's D effect size was large, $d = 1.44$.
- The mean difference between the initial test (section **a.**) and the final test (section **b.**) was **25.75%**, SD = 18.22, SEM = 5.76, $p = .002$. Cohen's D effect size was large, $d = 1.41$.

Non-parametric binomial tests on the probability of all 10 participants improving in each section of the final test were shown to be significant at the .001 level. This supported the finding that training enhanced performance.

Between group mean differences between improvements

Further support on the positive effect of training came from the findings that, on average, the control group did not perform better in the final test. Change in the mean levels of performance of the untrained control group between the initial and the final test were slightly lower in the final test, although the changes were insubstantial and not significant:

- The mean difference between the initial test (section **a.**) and the final test (section **a.**) was **-1.67%**, SD = 9.70, SEM = 3.96, $p = .691$. Cohen's D effect size was negligible, $d = 0.17$.
- The mean difference between the initial test (section **a.**) and the final test (section **b.**) was **-2.08%**, SD = 9.93, SEM = 4.05, $p = .629$. Cohen's D effect size was very small, $d = 0.21$.

Differences between the case study group and the control group

The mean differences between the case study group and the control group were significant, and effect sizes were large, confirming the differences between the trained and the untrained group and further supporting the positive effect of training:

- Mean difference between section **a.** in the initial test and section **a.** in the final test = **16.4%**, SEM = 5.12, $p = .008$, $d = 1.65$.
- Mean difference between section **a.** in the initial test and section **b.** in the final test = **27.8%**, SEM = 7.04, $p = .001$, $d = 1.90$.

4.5.iv. Part 1 - hearing functors: discussion

Inconsistency in the ability to process functors

Previous research has claimed that L2 speakers are not consistent in their use of functors, nor are they consistent in their ability to process these; for instance, Johnson, Shenkman, Newport and Medin (1996) reported that their participants responded inconsistently on the same auditory test given three weeks apart, and Ellis (1988) found that participants responded inconsistently even within a sentence. We would therefore have expected some participants in each group to perform better in the final test and some to perform less well if training had not had an effect. As seen in table 5 above, such a pattern of inconsistency was seen across the results of the control group. However, it was not seen in the results of the trained group, where all participants' performances increased in both sections of the final test.

The results from Part 1 show

- i. that the control group performed as expected with inconsistencies of performance across the initial and final tests
- ii. that the trained participants' performances were significantly enhanced in the final test.

Thus there is evidence that the training was beneficial and did have a positive effect in enhancing L2 listeners' abilities to recognise the reduced auxiliary verb and modal verb functors presented in this study.

Summary 2 – L2 listeners' abilities to recognise functors can be enhanced through training.

Patterns of error

We questioned whether participants' responses may have been influenced by a practice effect, mental fatigue or any kind of patterning. However, when examining the sequencing of errors versus accurate responses, we did not observe any particular pattern. Nor did we find that participants made either fewer errors nor more errors overall towards the end of the test. We therefore did not find evidence that responses were influenced by any particular pattern effect, nor by a practice effect leading to a higher level of accuracy towards the end of the test, nor by fatigue which would have led to less accuracy at the end of the test.

Types of error

Three types of error emerged from the results as shown in Table 7 below:

- Listeners missed the functor and reported not hearing one (= a 'not heard' morpheme)

- Listeners reported hearing a functor that had not been said (= an 'illusory' morpheme)
- Listeners recognised that a functor had been said, but did not correctly identify it (= the morpheme was 'confused' with another).

Table 7. Types of error given in numbers for the morpheme recognition tasks

Number of:	Trained N=10	Trained N=10	Trained N=10	Control N=6	Control N=6	Control N=6
	Initial test	Final test a	Final test b	Initial test	Final test a	Final test b
<i>Total no. of items:</i>	400	400	400	240	240	240
Total correct	258	317	361	195	191	190
Total errors	142	83	39	45	49	50
<i>Types of error:</i>						
Total not heard	35	10	7	13	14	14
Total illusory	20	24	6	9	7	3
Total confused	87	49	26	23	28	33
<i>Types of not heard:</i>						
Not heard -v	22	8	0	9	8	1
Not heard -d	13	2	0	4	6	11
Not heard -dv	0	0	0	0	0	0
<i>Types of illusory:</i>						
Illusory -v	7	14	1	4	2	0
Illusory -d	11	9	5	6	5	3
Illusory -dv	2	1	0	0	0	0

Across both groups and across both the initial and final tests, we see that the most common type of error was 'confused', that is, the participant heard that there was a functor but failed to recognise it accurately.

Both 'not heard' and 'confused' errors reduced overall in both sections of the final test for the trained participants, indicating that training was effective in enhancing participants' abilities to hear that there was a morpheme and to recognise what it was. We did not see the same for the control group.

Interestingly, both groups made a similar amount of 'illusory' errors in section a of the final test as in the initial test, but fewer in section b. One possible reason for this may be the re-syllabification that took place in section b. along with the intrusive /j/ sound between they and added – this may have led to an illusory phoneme being less likely.

These findings are of interest because they show that not only do L2 listeners miss hearing the articulation of functors, but also that functor errors may be caused by inaccurate recognition of the articulated sound.

The necessity of context to facilitate top-down recognition of morphemes?

It may be argued, that the recognition of speech sounds and functors requires both bottom-up and top-down processing and therefore L1 listeners would similarly be prone to missing or confusing morphemes in this task, where there was no context to facilitate top-down processing. Since we had administered this test to L1 listeners as Part 6 of Study 5, we were able to compare the results of the L2 participants in Study 7 with the L1 participants in Study 5.

There were 40, L1 listeners in Study 5, thus a total of 1,600 responses. Of these, we found that 1,569 were correct and only 31 were incorrect. The distribution of errors was:

- 15 x 'not heards' (- 7 x 'v'; 8 x 'd')
- 4 x 'illusory' (- 4 x 'd')
- 12 x 'confused'.

Thus, the L1 listeners from Study 5 made fewer than 2% errors in this test, whereas the case study group and the control group made slightly more than 20% errors in the same test taken as the final test. There is some evidence from this test then that L1 listeners may well recognise functors through bottom-up perceptual processing, without context being obligatory. In fact, 22 of the 40 L1 participants responded with 100% accuracy.

Summary 3 – L2 listeners make three types of errors related to functors when listening to connected speech: some morphemes are not attended to, some morphemes are attended to but wrongly recognised, and sometimes morphemes are ‘heard’ as present when they are not.

7.5.v. Part 2 - sentence recognition and recall: results

The aim with Part 2 was to investigate L2 listeners’ abilities to segment and recognise words and grammar structures in spoken sentences and then to recall these in written form. The research question was whether the implicit training on hearing reduced and modified morphemes would facilitate this ability. We were particularly interested in L2 listeners’ abilities to recognise and re-construct 3rd conditional sentences and the grammar of the two clauses in this type of sentence: the ‘if’ clause which is formed of a verb phrase using the past perfect tense, and the main clause which is formed of a modal verb phrase indicating a possibility in the past. (Example of a 3rd conditional sentence: *If you had left the laptop for me, I would have used it.*)

To this end, we investigated the data through the following five categories, a – e:

- a. The ability to recognise and recall words accurately and in the correct position in a sentence
- b. The ability to recognise and reconstruct the syntax of 3rd conditional sentences
- c. The ability to recognise the past perfect tense construction of verb phrases – this construction was used both in 3rd conditional sentences and also other types of sentence, e.g. *They asked whether she had always lived there.*
- d. The ability to recognise the modal verb phrase which denoted a possibility in the past (e.g. *I would have used the laptop*) – this construction was included in 3rd conditional sentences and also in other types of sentence, for instance, *She would have liked a cup of tea and a biscuit, but wasn’t offered either.*

- e. Missing content words – participants were asked to put a line, or leave a space, if they missed a word or part of a sentence – generally participants are not aware when they have missed function words, and awareness of missed words therefore related here to missed content words. We expected ‘missed words’ to decrease after training as we expected participants to recognise more of the words.

The sentences in all items were articulated with all the reductions and modifications of functors that occur in natural speech. Thus past perfect constructions were reduced, for example, from *He had read* to *He’d read*; and modal verb constructions were reduced from *He would have enjoyed* to *He’d’ve enjoyed*.

It should be noted that:

- In category c (past perfect constructions), we included only positive phrases in the analysis. We excluded sentences with negations (with *not*) and sentences that were questions from the final count for analysis even though these had been included in the sentence dictations. This exclusion was because the addition of *not* and the change of word order in questions lead to the auxiliary verb *had* becoming more salient (e.g. it is easier to hear *had* when spoken as *He hadn’t walked*, or *Had he walked?* than when said as *He’d walked*).
- In category d (would + have + past participle constructions), we included positive and negated phrases (e.g. *He’d’ve walked* and *He wouldn’t’ve walked*) but excluded questions (*Would he’ve walked?*) because *would* is more strongly stressed in a question and is also separated from the auxiliary verb *have* by the grammatical subject of the sentence.
- We included all item types in the other three categories (a, b & e) in the analysis.

The results can be seen in tables 8a and 8b below. 8a shows the number of items, 8b shows the mean differences in percentages between the initial and the final test for each participant.

Table 8a. Part 2 - results from the sentence dictation tasks: initial test and final test – shown in numbers

Participant	No. of correct words (in correct position with all morphemes correct) Initial test – final test a	3 rd conditional correct Initial test – final test b	Past perfect correct Initial test – final test c	Would or wouldn't + have + past participle Initial test – final test d	Sentences with missing content words: marked as missing Initial test – final test e
801	338/417 - 404/423	6/16 – 12/20	8/22 – 17/22	9/11 – 11/12	3/40 – 2/36
803	218/417 - 279/423	0/16 – 1/20	0/22 – 4/22	0/11 – 2/12	6/40 – 1/36
804	315/417 - 375/423	2/16 – 16/20	6/22 – 16/22	3/11 – 8/12	0/40 – 0/40
805	238/417 - 333/423	0/16 – 17/20	0/22 – 13/22	1/11 – 11/12	9/40 – 4/36
806	331/417 - 362/423	0/16 – 11/20	2/22 – 10/22	3/11 – 7/12	0/40 – 0/36
807	216/417 - 273/423	0/16 – 6/20	0/22 – 8/22	0/11 – 3/12	17/40 – 7/36
808	283/417 - 349/423	0/16 – 5/20	0/22 – 5/22	2/11 – 9/12	6/40 – 4/36
809	322/417 - 337/423	0/16 – 6/20	6/22 – 6/22	0/11 – 6/12	2/40 – 4/36
810	135/417 - 171/423	0/16 – 4/20	0/22 – 6/22	0/11 – 3/12	27/40 – 10/36
811	266/417 - 316/423	1/16 – 3/20	1/22 – 3/22	0/11 – 4/12	0/40 – 0/36
813	290/417 - 305/423	1/16 - 0/20	1/22 – 5/22	3/11 – 4/12	6/40 – 1/36
814	276/417 - 345/423	0/16 - 2/20	0/22 – 9/22	1/11 – 1/12	6/40 – 4/36
815	387/417 - 412/423	12/16 - 16/20	18/22 – 18/22	10/11 – 12/12	0/40 – 0/36
816	376/417 - 408/423	6/16 - 12/20	9/22 – 13/22	6/11 – 11/12	0/40 – 0/36
817	323/417 - 366/423	0/16 - 7/20	2/22 – 8/22	7/11 – 7/12	1/40 – 1/36
818	222/417 - 244/423	0/16 - 0/20	0/22 – 0/22	0/11 – 0/12	2/40 – 3/36

- Past perfect: only includes positive sentences (questions, and negations have been excluded).
- Would/wouldn't sentences: questions have not been included in this category.
- 3rd conditional sentences include all: positive, negated, & questions.
- Sentences with missing words = sentences where the participant is aware that they have missed content words and indicated this by putting lines or leaving spaces.

Participants results were analysed in SPSS, version 25. Repeated measures t-tests were run for within group differences between the initial test and the final test. Independent samples t-tests were run for mean differences between the case study group and the control group. Levene's test of equal variances were not significant and therefore equal variances were not assumed.

Table 8b. Part 2 - results from the sentence dictation tasks: mean differences between the initial test and the final test in **percentages**. Shown together with standard deviations, standard errors of the mean, and Cohen's D effect sizes for the mean differences.

Participant	No. of correct words: a (in the correct position with all morphemes correct) (positive result = progress)	3 rd conditional correct: b (positive result = progress)	Past perfect correct: c (positive result = progress)	Would or wouldn't + have + past participle: d (positive result = progress)	Sentences with missing content: e (negative result = progress)
801	81.06 – 95.51 = + 14.45	+ 22.75	+ 40.91	+ 9.85	- 1.94
803	52.28 – 65.96 = + 13.68	+ 6.25	+ 18.18	+ 16.67	- 12.22
804	75.54 – 88.65 = + 13.11	+ 67.50	+ 45.45	+ 39.40	0
805	57.07 – 78.72 = + 21.65	+ 85.00	+ 59.09	+ 82.58	- 11.39
806	79.38 – 85.58 = + 6.20	+ 55.00	+ 36.36	+ 31.06	0
807	51.80 – 64.54 = + 12.74	+ 30.00	+ 36.36	+ 25.00	- 23.06
808	67.87 – 82.51 = + 14.64	+ 25.00	+ 22.73	+ 56.82	- 3.89
809	77.22 – 79.70 = + 2.48	+ 30.00	0	+ 50.00	+ 6.11
810	32.37 – 40.43 = + 8.06	+ 20.00	+ 27.27	+ 25.00	- 40.22
811	63.79 – 74.70 = + 10.91	+ 8.75	+ 9.09	+ 33.33	0
<i>N = 10 mean</i>	+ 11.8*** <i>SD= 5.29 SEM= 1.67 d= 2.23</i>	+ 35.0** <i>SD= 25.98 SEM= 8.23 d= 1.34</i>	+ 29.3** <i>SD= 17.70 SEM= 5.60 d= 1.66</i>	+37.0*** <i>SD= 21.43 SEM= 6.78 d= 1.73</i>	- 8.6 ^{ns} <i>SD= 13.76 SEM= 4.35 d= 0.63</i>
813	69.54 – 72.10 = + 2.56	- 6.25	+ 18.18	+ 6.06	- 12.22
814	66.19 – 81.56 = + 15.37	+ 10.00	+ 40.91	- 0.76	- 3.89
815	92.81 – 97.40 = + 4.59	+ 5.00	0	+ 9.09	0
816	90.17 – 96.45 = + 6.28	+ 22.50	+ 18.18	+ 37.12	0
817	77.46 – 86.52 = + 9.06	+ 35.00	+ 27.28	- 5.31	+ 0.28
818	53.24 – 57.68 = + 4.44	0	0	0	+ 3.33
<i>N = 6 mean</i>	+ 7.0* <i>SD= 4.62 SEM= 1.89 d= 1.53</i>	+11.0 ^{ns} <i>SD= 15.26 SEM= 6.23 d= 0.72</i>	+ 17.4* <i>SD= 15.85 SEM= 6.47 d= 1.10</i>	+ 7.7 ^{ns} <i>SD= 15.30 SEM= 6.25 d= 0.50</i>	- 2.1 <i>SD= 5.47 SEM= 2.24 d= 0.38</i>
mean difference between the two groups	4.8^{ns} <i>SEM= 2.52 d= 0.97</i>	24.0* <i>SEM= 10.31 d= 1.13</i>	11.9^{ns} <i>SEM= 8.56 d= 0.58</i>	29.3** <i>SEM= 9.21 d= 1.57</i>	6.5^{ns} <i>SEM= 4.90 d= 0.62</i>

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} p > .05.

4.5.v. *Part 2 - sentence recognition and recall: discussion*

The results provide some statistically significant evidence that training has benefits

Category a: The results show us that all participants, both trained and control, performed better in the final test than in the initial test in respect of the number of words they were able to recognise accurately and reproduce in the correct order. On average, the trained participants' accuracy levels increased more than the control groups' at 11.8% (significant at the .001 level) and 7.0% (significant at the .05 level) respectively. Both groups showed a large effect size for their within group differences, but that of the trained group was larger than that of the untrained group ($d = 2.23$ and $d = 1.53$ respectively). However, the difference between the two groups' mean increases was small at only 4.8%. Although the difference could not be shown to be significant ($p = .085$), the effect size of the difference was large, at 0.97, providing some evidence that the trained group's improvements were larger than the non-trained group's.

A non-parametric binomial test on the probability of 10 out of 10 participants in the trained group improving in the final test showed the increase to be significant at the .001 level. The probability was also shown to be significant for the 6 control group participants at the .05 level ($p = .016$).

Category b: All 10 trained participants showed improvements in respect of recognising and reproducing the 3rd conditional structures, with a mean improvement rate of 35.0%. In the control group, improvements were only seen for 4 out of the 6 control participants, and the group mean improvement rate was 11.0%. An independent samples t-test showed that the difference of 24.0% between the means of the two groups was significant at the .05 level. The effect size was large, at 1.13. Therefore, there was some evidence that training had facilitated the case study participants' abilities to a larger extent than if they had not been trained.

Non-parametric binomial tests showed that the probability of an increase in performance of all 10 out of 10 trained participants showed the increase was significant at the .001 level; however, for the control group as a whole with 2 out of 6 participants not making improvements, the increase was not significant, as p was larger than .05.

Category c: 9 out of 10 trained participants showed improvements in accurately recognising the verbs in the past perfect tense; the results of the 10th trained participant were static across the initial and final tests. The mean increase for the group was 29.3%. In the control group, 4 out of 6 participants showed improvements, with the results of the other two remaining static. The mean increase for the control group was 17.4%. Thus the difference between the means of the two groups was 11.9%, but this difference could not be shown to be significant ($p > .05$). The effect size of the difference was only medium. Similarly to Study 6, both the trained and the untrained L2 groups showed better recognition in the final test than in the initial test of the reduced 'd representing the auxiliary verb *had*, but with the trained group showing a larger increase than the untrained group.

Non-parametric binomial tests showed that the probability of the increase in performance of the trained participants was significant at the .002 level. For the control group, the numbers were too small to be calculated.

Category d: We did find a significant difference between the mean increase of the two groups in terms of recognising and accurately re-presenting the 'would/wouldn't + have + past participle' construction. The mean increase in performance for the trained group was 37.0% ($p \leq .001$, $d = 1.73$), and for the control group it was 7.7% ($p > .05$, $d = 0.50$). The difference in means was thus 29.3%, significant at the .01 level, with a large effect size ($d = 1.57$).

The probability of all 10 trained participants improving in the final test was confirmed through the non-parametric binomial test with p at the .001 level. Numbers for the control group were again too small in this category for the probability levels to be tested.

Category e: As participants showed improvements in the final test in category a, we expected them similarly to have fewer missing words in category e. On average, the trained group performed 8.6% better in the final test than in the initial test, and the control group performed 2.1% better. The difference between the means of the two groups was 6.5%, but this difference could not be confirmed as significant, as p was larger than .05. The effect size was only medium.

Three of the trained group participants had no missing content words in the initial test. Six of the remaining seven showed decreases in missing words, but the seventh showed an increase. The non-parametric binomial test did not show this increase to be significant ($p = .06$). The numbers were too small for a binomial test of the four participants in the control group who showed either an increase or a decrease in missing words.

In sum

In sum, both groups performed better on average in the final test in all five categories than they did in the initial test. However, the mean increase for the trained group was higher than the mean increase for the control group in all the categories, but the difference could only be shown to be significant for categories b and d – accurate recognition of 3rd conditional grammar structures and of perfect modality structures for past events. There was no decrease in accuracy for any of the trained participants in a – d; however, decreases in levels of accuracy in categories b and d were seen in the results of some participants' in the control group. Tests of the probability that all the individuals in each group would improve in the final test were significant for the trained participants

in terms of correct recognition of words, 3rd conditional sentence structures, past perfect verb tense structures, and modal + auxiliary verb structures denoting past tense possibilities (categories a – d); but for the control group, only the probability in category a could be shown to be significant.

Summary 4 - Training L2 listeners to match spoken sounds with (reduced) functors and other sound modifications in spoken sentences seems to develop the listeners' abilities to recognise functors when listening to speech, which, in turn, enhances accuracy in word recognition and consequently in sentence processing.

A small average increase in performance for the control group

We suggest there may be two possible reasons why the control group showed some small increases in mean levels of accuracy. The first is that the initial test may have served as a kind of training, albeit limited, for the control group. The types of sentences, grammatical structures, and functors would not have been new for L2 speakers at the high English levels of the group; taking the initial test may have made the participants pay more attention to the surface form of the language and notice more of the functors and third conditional structures. In this way, the initial test might have had a priming effect. Moreover, having taken the initial test, participants would have known what to expect in the final test and, as a result, been able to focus more on the sentences than on what was to come in the test situation. The second is that the final test was, in some way, easier than the initial test. Nevertheless, if the second reason were correct, the positive effect of training should not be ignored, since the trained group made significantly higher levels of improvement in at least three areas in which they had been trained.

The effects of implicit training

Training of the grammar structures was implicit. Apart from the explicit 3rd conditional exercises in the first training session, grammar was not discussed. Participants were shown how auxiliary verbs and modal verbs were reduced, and in the fourth and fifth sessions there was specific focus on re-syllabification and on intrusion of semi-vowels in the articulations of L1 English speakers. Participants were trained to match streams of speech to retrieval of words and morphemes, but there was no training on comprehending the syntax of the sentences. The question arises then as to whether we could expect an enhanced level of accuracy in L2 listeners' abilities to process language structure without enhancing their comprehension of the structure? The following two points are related to this question:

- i. From his reproduction of the sentences he listened to, we know that Participant 809 heard the 'd sound which represented the reduced form of both *would* and *had*. However, he confused these two verbs when writing his sentences: in the initial test he confused the two verbs five times – four times writing *had* instead of *would* and once using *would* instead of *had*. In the final test, he confused the two verbs eight times – four times writing *had* instead of *would*, and four times doing the reverse. As such, he could hear the presence of the functor and recognise it correctly as 'd, but did not associate it correctly with the function of the verb and therefore was confused as to whether it represented *had* or *would*.
- ii. Both Participants 804 and 809 changed the word order of functors on several occasions in both the initial and the final test, thus demonstrating unreliable temporal order judgements. 'Temporal order judgements' refers to a listener's ability to recognise what they hear in the same sequence as it is produced – here it relates to listeners hearing words or morphemes but not recognising the sequence of the spoken words/morphemes correctly. Participant 804, who had been in the UK for five years, changed the order of the pronoun and the auxiliary

verb *have* on several occasions, writing, for example, *where/what you've ...?* (instead of *where've/what've you ...?*); *they've should been* and *they'd might never met* (instead of *they should've been* and *they might never've met*). Participant 809 not only confused *would* and *had* but also changed the position of the reduced 've and 'd, so that 'd 've (*would have*) was reproduced as *have had*. To our knowledge, temporal order judgements of function words have not been discussed in relation to L2 audible sentence processing and would be worthy of further study.

Summary 5 – Implicit training is useful, but it may be useful to complement it with explicit training as to the function of the cues.

Further to the findings in summary 5, we recommend that training should include comprehension checks in relation to comprehension of syntax forms and syntax meaning.

7.5.vi. *Part 3 – E-Prime test of 3rd conditional sentence comprehension: results and discussion*

In Part 3 of the tests, participants completed an E-Prime test of comprehension in which they read a question on the screen of the laptop and then listened to a third conditional sentence. Responses to the questions of 'yes', 'no' or 'don't know' were based on the information given in the sentences. To respond, participants pressed a key on the keyboard. Table 9 below shows the participants' levels of accuracy in comprehending the 3rd conditional sentences and answering the questions correctly. The analyses were conducted through within-group repeated measures t-tests and between-group independent samples t-tests in SPSS, version 25.

Table 9. Results of participants' responses in Part 3 – accuracy rates given in number of items and in percentages. Group means and mean differences are given with standard deviations, standard errors of the mean, and Cohen's D effect sizes.

Participant	First language	INITIAL TEST Correct responses – E-Prime	FINAL TEST Correct responses – E-Prime	Difference between initial and final test – accurate responses in %
801	Creole (English) (Grenadian)	(A) 40/64 = 62.5%	(A) 62/64 = 96.9% 801 took set A again – paper-based	+ 34.40
803	Chinese	(A) 45/64 = 70.3%	(B) 50/64 = 78.1%	+ 7.80
804	Arabic (Iraqi)	(A) 61/65 = 95.3%	(B) 62/64 = 96.9%	+ 1.60
805	Japanese	(B) 55/64 = 85.9%	(A) 60/64 = 93.8%	+ 7.90
806	Arabic (Egyptian/Iraqi)	(A) 61/64 = 95.3%	(B) 59/64 = 92.2%	- 3.10
807	Thai	(A) 39/64 = 60.9%	(B) 53/64 = 82.8%	+ 21.90
808	Arabic (Saudi)	(A) 55/64 = 85.9%	(B) 59/64 = 92.2%	+ 6.30
809	Arabic (Saudi)	(A) 64/64 = 100%	(B) 58/64 = 90.6%	- 9.40
810	Korean	(B) 32/64 = 50.0%	(A) 50/64 = 78.1%	+ 28.10
811	Thai	(B) 31/64 = 48.4%	(A) 47/64 = 73.4%	+ 25.00
<i>Group mean</i>		+ 75.4 <i>SD= 19.42</i> <i>SEM= 6.14</i>	+ 87.5 <i>SD= 8.61</i> <i>SEM= 2.72</i>	+ 12.1* <i>SD= 14.49</i> <i>SEM= 4.58, d= 0.83</i>
813 – control	Arabic (Saudi)	(B) 42/64 = 65.6%	(A) 50/64 = 78.1%	+ 12.50
814 – control	Spanish (Chilean)	(A) 56/64 = 87.5%	(B) 54/64 = 84.4%	- 3.10
815 – control	Bulgarian	(A) 62/64 = 96.9%	(B) 61/64 = 95.3%	- 1.60
816 – control	Bulgarian	(B) 62/64 = 96.9%	(A) 61/64 = 95.3%	- 1.60
817 – control	Turkish	(A) 55/64 = 85.9%	(B) 56/64 = 87.5%	+ 1.60
818 – control	Chinese	(A) 51/64 = 79.7%	(B) 49/64 = 76.6%	- 3.10
<i>Group mean</i>		+ 85.4 <i>SD= 11.78</i> <i>SEM= 4.81</i>	+ 86.2 <i>SD= 8.10</i> <i>SEM= 3.31</i>	+ 0.8^{ns} <i>SD= 5.99</i> <i>SEM= 2.45, d= 0.13</i>
mean difference				11.3* <i>SEM= 5.19, d= 1.02</i>

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. ^{ns} p > .05.

It should be noted that Participant 801 took the E-Prime test (set A) in the initial test on the laptop. In the final test there was a technical issue, and so 801 took test A again, this time using the paper-based booklet from the pilot study to read and record responses, while listening to the recordings of the sentences as the pilot study participants had done. Taking the same test again may have skewed her results a little in the final test.

Eight of the trained participants showed an increased level of accuracy in the final test, and two showed a decrease. Of the two whose levels decreased, one (806) was distracted by health issues, the other (809) said he felt performance anxiety since he had scored 100% in the initial test and was afraid he would not achieve a perfect score again. Nevertheless, the mean increase for the group was significant. In contrast, the mean increase of 0.8% for the control group could not be shown to be significant, quite probably because the scores of only two people increased, while the scores of four control participants decreased.

On the question of whether an improvement in the scores of eight out of ten participants might have happened by chance (through guesswork), a non-parametric binomial test did not indicate that this was not the case, since p was larger than .05. However, when we excluded the results of the participant who underperformed due to health reasons (806), the binomial test did show the probability of eight out of nine participants in the group performing better in the final test after training was unlikely to be due to chance since p was .02.

The difference in means of improvement between the two groups at 11.3% was shown to be significant at the .05 level, with a large effect size. This would indicate that training had an impact on the listeners. However, it is worth noting that since two of the six control group participants started with a high level of accuracy, their ability to improve was restricted.

Although we collected data on participants' reaction times, we have not included the calculations for these here, as we discovered that three of the participants (two control participants and one trained participant) had devised techniques for answering the questions without the need to fully process the sentences. They were thus responding to the questions based on technical clues rather than on comprehending the sentences – this applied in both the initial and the final tests, where all three participants (804, 815 and 816) scored 61 or 62 answers out of 64 correctly; additionally, 815 and 816 answered the questions in the final test with great speed having devised and practised their technique in the initial test. Since this would have skewed the analysis of the RTs, we have not included these here.

The RT situation caused us to re-evaluate the validity of the test. With hindsight, we should have included additional sentences of different types to prevent participants from anticipating methods for answering and thereby being able to respond somewhat mechanically. However, when designing the test, we had been concerned about its length of 64 items, necessary for including the various combinations, and we had not wanted to overload the participants by adding additional items. Notwithstanding, although the test had a design limitation in relation to reaction times, we consider that the test had merit in terms of testing accuracy in relation to comprehension. Some people are able to create mental models of sentences despite not conducting a full analysis of them, as seen in the work of Garnham (1987), Oakhill, Garnham and Vonk (1989), Ferreira, Ferraro and Bailey (2002) and Ferreira (2003). Thus, being able to give correct answers as 804, 815 and 816 were able to, may well reflect the 'good enough' processing that people have been established to engage in. We do not consider that this invalidates the accuracy results, rather that it reflects certain norms of processing.

Summary 6 – Training seems to augment listeners’ abilities to comprehend 3rd conditional complex sentences. While listeners may, or may not, conduct a full analysis of sentences, increases in accuracy of responses reflect enhanced levels of performance in this area.

4.6 Conclusions

This study set out to explore whether training could enhance L2 listeners’ abilities to detect and recognise auditory speech signals that represent morpho-syntactic information in sentences and thus enhance accurate comprehension of spoken sentences. To this end, we trained ten L2 listeners by exposing them repeatedly to the surface form of reduced and co-articulated functors used in verb phrases, in the: past tense, present perfect, past perfect, and modal perfect ‘tenses’. Moreover, a high number of sentences with third conditional structures were included. In the main, training involved recognising reductions and modifications in speech but did not involve explicit training on comprehension of syntax. Participants were tested pre-training and again post-training to measure changes that training might have been effected. Six other L2 listeners participated as part of a control group set up to measure whether L2 listeners without training might also perform better in the final test than in the initial test.

Results showed that training did augment listeners’ performances in recognising morpho-syntactic information in sentences, and this did lead to an increase in the ability to process audible sentences. In particular, the results showed us the following:

- i. Participants themselves considered that training had helped them both to recognise reduced morphemes and to understand better what others said.
- ii. L2 listeners’ abilities to recognise functors was developed through training on functor recognition.

- iii. L2 listeners made three types of errors related to functors when listening to connected speech: some morphemes were not attended to, some morphemes were attended to but wrongly recognised, and sometimes morphemes were 'heard' as being present when they were not. Training helped listeners to develop their ability both to attend to morphemes and to recognise these more accurately but did not appear to reduce illusory morphemes.
- iv. Developing listeners' abilities to recognise functors when listening to speech, enhances accuracy in word recognition and consequently in sentence processing.
- v. Implicit training does benefit listeners but it may be useful to complement it with explicit training and with comprehension checks in relation to comprehension of syntax forms and syntax meaning.
- vi. Training did seem to augment comprehension of the complex 3rd conditional sentences, although measuring this showed that some participants may have relied more on partial than on full mental modelling.

In this study, we set out to investigate the thesis research question 4 on whether we can find techniques to improve L2 listeners' abilities in respect of processing functors and utilizing them in sentence reconstructions? We believe this study has provided sufficient evidence to show that this is possible.

However, the amount of listening training that each participant received was limited to just eight hours, when we exclude the first hour spent on 3rd conditional practice exercises, and we possibly attempted to work on too many aspects of co-articulation together with third conditional training. A limitation of the study is that we did not carry out further tests at a later date to explore long-term effects.

Chapter 5 – Discussion and conclusion

The purpose of this thesis was to contribute to the understanding of how people listen to English as a second, or additional, language. The focus was on listeners' abilities to recognise the grammar of the sentences they hear. In particular, the thesis focused on the morpho-syntax of sentences rather than on word order or on strategies for parsing sentences into meaningful units.

In total, the thesis included seven studies. The first five studies tested listeners' abilities to recognise different functors in spoken sentences, and the last two studies tested listeners' abilities both to recognise functors and to be able to include them in reconstructions of whole sentences, as follows:

In studies 1 and 4, we tested listeners' abilities to recognise bound inflectional morphemes. In Studies 2 and 5, we tested listeners' abilities to recognise auxiliary verbs (both primary and modal auxiliary verbs) reduced to clitics. In Study 3 we tested listeners' abilities to recognise bound derivational morphemes. In Study 6, we asked listeners to listen to sentences and tested their abilities to reconstruct and reproduce the sentences; following that we devised a training programme for four case study participants to investigate whether focused training could facilitate an improved performance in reconstructing and reproducing sentences to which they had listened. In Study 7, we built on the findings from Study 6 to work with a larger group of case study participants. We developed the training programme from Study 6 and added an additional test of comprehension to further investigate the efficacy of the devised training programme.

The participants across the studies were both L1 speakers of English and L2 speakers of English. The L2 speakers had a range of first languages from different language family groups around the world. The L1s of the L2 English speakers included: Arabic, Cantonese, Chinese, Czech, Danish, Dutch, Filipino, French, German, Greek, Hindi, Italian, Japanese, Korean, Kurdish, Persian, Polish, Portuguese, Punjabi, Romanian, Russian, Slovenian,

Spanish, Turkish, and Vietnamese. Thus the L2 groups had a good mix of nationalities as would be found in higher education establishments. Since we were interested in the listening abilities of L2 speakers with higher levels of language proficiency who had spent time in English speaking environments, we worked exclusively with participants who were either students or academic members of staff at UK universities. This choice additionally meant that all participants had experience of paying attention and focusing on tasks in test-type situations, and were used to listening to English for extended periods of time (e.g. in English classes, seminar classes, or lectures), both of which were required for completing the tests in the thesis studies.

Results from the studies provided a number of interesting insights.

1. *L1 listeners performed with a high level of accuracy, but there is some evidence that they did not always pay attention to sub-lexical syntactic cues.*

As a group, L1 listeners made very few errors in recognising the relevant functors in the spoken sentences in Studies 1 – 5. However, when the sentence lengths were increased in Studies 1 and 2, accuracy levels did decrease slightly, although still remaining above 90%.

L1 listeners made a significantly higher percentage of errors pro rata of reporting illusory functors when none were present than of not recognising the presence of functors – this occurred in both the short and the longer sets of sentences in Study 1 and in the longer sentences in Study 2. Since these sentences provided semantic contexts with each sentence being different, we suggest that the higher rate of illusory errors was due to L1 listeners over-relying on top-down processing for semantic interpretation. Semantic interpretations may have been less meaningful in the shorter sentences of Study 2 since little semantic context was given, and here we did not see any real difference between the two types of error, suggesting

that top-down interpretations were less relevant and therefore led to fewer illusory morphemes. Moreover, in Study 5, where there were only few sentences which were repeated several times, and therefore very limited possibility of semantic interpretations, we found no clear pattern of 'illusory' errors and errors of 'not heards'. (Study 4 did not include L1 listeners.)

In Study 6, we found the predominant errors made by L1 listeners in the sentence dictation tasks were omissions of the primary auxiliary verb *have*, in both its present and past forms, used to denote the present perfect and the past perfect tenses. As such, reconstructions of the sentences from the sentence dictation tasks sometimes included the past simple tense instead of the present perfect or past perfect tenses. In many cases, this omission did not alter the meaning of the sentences. However, in respect of 3rd conditional sentences, when the past perfect 'd (*had*) functor was omitted, we suggest that it did matter, because the use of the past tense instead of the past perfect tense in the if clause is used in 2nd conditional structures, and it should therefore be understood as denoting a present or future action (e.g. *If it **snowed** tomorrow, I would stay at home.*) Thus, using the past tense in the if-clause of a 3rd conditional sentence, instead of the past perfect tense, can lead to less grammatical precision and a risk of slight grammatical confusion (e.g. *If it **snowed** yesterday, I would have stayed at home* instead of *If it **had snowed** yesterday, I would have stayed at home*). Nevertheless, we acknowledge that the use of the past tense instead of the past perfect tense, even in 3rd conditional sentences, is becoming a little more usual in everyday British English and is not uncommon in everyday American English. We conclude that in cases where the 'd (*had*) functor was omitted, the L1 listeners were writing what they were used to hearing, and used to saying, rather than what they actually heard.

Moreover, in respect of 3rd conditional sentences, we found that half the L1 listeners reproduced at least one 3rd conditional sentence using a non-standard form of the 3rd conditional structure, which has come to be used in everyday English, but which was not said in the audio recordings. The standard form is: *Would you have read the book if I **had lent** it to you?* The most common non-standard form is: *Would you have read the book if I **would have lent** it to you?* A second non-standard form is: *Would you have read the book if I **had have lent** it to you?*

Another, but more minor, issue we found was that the L1 listeners in Study 6 made occasional errors with pronoun changes, of which the most frequent was changing *he* to *you*. The sentences in the study did not contain references to who the people were, and therefore the pronouns had no antecedents. The pronoun changes produced by the L1 listeners may suggest that listeners, in some instances, did not pay enough attention to the surface form of the pronoun and were therefore not able to reproduce it accurately when the referential antecedent was not given. This is of interest because some of the pronouns that were changed functioned grammatically as the subject of the sentence (the agent) and should have been a key element of the sentence.

There is therefore some evidence from the above that L1 listeners do not always pay attention to the surface form details of sentences, in particular to the sub-lexical syntactic cues for sentence comprehension. Instead, the evidence suggests that L1 English speakers do at times rely on top-down processes and lexical-semantic knowledge for a 'good enough' understanding of the meaning of sentences, even in such focused tasks as the ones in the studies of the thesis. These findings are in line with, and support findings by, previous researchers, such as Ferreira, 2003; Garnham, 1987; Mattys & Wiget, 2011; Oakhill et al., 1989.

Furthermore, the evidence from Studies 1 and 2 suggests that an increase in the amount of incoming data lessens the attention paid to sub-lexical syntactic cues.

2. *L2 listeners were able recognise the presence or absence of functors in sentences, although to a lesser extent than L1 listeners. Increasing the amount of input listeners needed to process (in Studies 1 and 2) led to decreases in the ability to notice functors (i.e. past tense verb inflections and auxiliary verb clitics).*

L2 listeners: Even though some individual L2 listeners made a considerable number of errors when trying to recognise functors, all L2 participants were able to recognise the presence or absence of all the types of functors we presented in Studies 1 – 5, at least on some occasions, irrespective of their L1. Mean group levels of accuracy were well over 75%, apart from in the longer sentences in Studies 1 and 2 where the mean accuracy rate for the L2-lower group fell to 64.7 and 65.8% respectively.

Across Studies 1 – 5, out of the 534 test scores we obtained from L2 listeners, only 13 of the scores (2.4%) were under 50%. Scores under 50% ranged from 33.3% to 48.8%. That means listeners were mostly able to recognise more than half the functors, and never less than a third of the functors, in any test. A few L2 listeners made no errors in some of the tests, with 78 of the accuracy scores (14.6%) at 100%. This means, to a larger extent, that the L2 listeners in the studies were able to segment the relevant parts of sentences to recognise whether or not particular functors had been present in the input. However, there were deficits in their abilities.

As with the L1 listeners, when the sentence length increased in Studies 1 and 2, and thereby the amount of spoken input increased, the level of accuracy

decreased for the L2 listeners. Moreover, the mean difference in accuracy rates between the L1 and the L2 listeners increased when the sentence lengths increased, showing that error rates increased more for L2 listeners than for L1 listeners. We see then that both L1 and L2 listeners were negatively affected by the increase in input, but the negative effect was larger for the L2 listeners. This may perhaps be explained through issues related to cognitive load. The additional input in the longer sentences may have led to additional cognitive load which, in turn, led to more distractions. Rost (2014) points out that distractions are likely to be due to temporary processing lapses, which lead to attention being disrupted. According to Rost, such disrupted attention then places more stress on the listener, leading to more cognitive load. It is likely that task performance was affected negatively by more disrupted attention among both the L1 and the L2 listeners when sentence length increased.

In respect of L2 listeners, an increase in sentence length may have led to three effects. Firstly, through additional cognitive load and distractions, listeners' capacity to lexically segment relevant parts of the sentences may have been reduced, which would have added to the issues of distraction when L2 listeners were unable immediately to place speech sounds within the context of a spoken word. That distractions could both lead to, and be caused by, lexical segmentation issues would be in line with findings by other researchers, such as Field (2003), Liu (2002) and Renyanda & Farrell (2011). Secondly, the increase in cognitive load may have reduced listeners' abilities to notice the relevant functors. As VanPatten (1990) said, it is difficult for L2 listeners to notice the surface form and the meaning of a sentence at the same time. It is possible that the greater amount of information in the longer sentences caused listeners to attend more to the meaning of the sentences in order to identify the verbs, which then weakened their abilities to notice the functors. Thirdly, the additional amount of information may have reduced listeners' abilities to recall relevant parts of sentences through

echoic memory. In respect of memory, as stated by a number of researchers (e.g. Flowerdew & Miller, 2005; Garnham, 1985), the exact surface form of a speech signal is lost to memory after a few seconds, and what remains is the meaning of the sentence rather than its form. Radford et al. (2009) suggest that memory for syntax is unreliable about 30 seconds after a sentence has been heard. As an increased input increases the need for attentional control and thus increases the load on working memory, this may subsequently affect online processing ability. Some L1 listeners reported in Study 2, where they made few errors, that they wrote their response quickly if they heard it easily; however, if they were unsure, they replayed the sentence in their minds before responding. This does indicate that L1 listeners were able to rely on echoic memory for their reconstructions of relevant parts of sentences, although this echoic memory was most likely underpinned by listeners' knowledge of grammar and contingency. If working memory is less robust in the L2 than the L1, L2 listeners would have been more affected than L1 listeners by increases in input, which could account for differences between the L1 and the L2 groups. If all three effects mentioned above were at play, it would be understandable that L2 listeners would be affected exponentially more than L1 listeners in task performance as spoken input increased. We are reminded that Bosker et al. (2017) suggest that the effort of listening in a foreign language can cause higher cognitive loads than listening in a native language.

However, in respect of sentence length, it is worth noting that the same L2 listeners performed better in Study 3 where the sentence lengths were a little longer on average (15 – 18 words) than the longer sentences in Studies 1 and 2 (10 – 15 words). L1 listeners also performed better in Study 3 with nearly 99% accuracy. The mean difference between the L1 group and the L2-higher group was smaller in Study 3 (at 10.5%) than it was in the longer sentences in Study 1 (at 18.0%) or in the longer sentences in Study 2 (at 17.7%). Although it is not possible

to directly compare Studies 1 and 2 with Study 3 since the tasks were different, it is interesting to note that the longer sentences in Study 3 were not as problematic as the longer sentences in Studies 1 and 2.

3. *Even when L2 listeners could recognise the presence of a functor, they were not always able to identify it correctly.*

An important finding that emerged was that while L2 listeners could, to a large extent, recognise whether or not a relevant functor had been spoken, they were not always able to identify it correctly. Section 6 in Study 5 showed that L2 listeners could not always discriminate between the reduced functors *'d (had)*, *'ve (have)* and *'d've (would have)*. We also found that L2 listeners in Studies 6 and 7 confused the same three sets of functors, both in the functor recognition tests and in the sentence dictation tests. This was not an issue for the L1 listeners.

In Study 2, L2 listeners showed some errors in respect of identifying whether or not they had heard a pronoun plus auxiliary verb clitic or a modal verb plus auxiliary verb clitic. Although the error rate for the L2 listeners was small (3.0% in the short sentences and 4.4% in the longer sentences), it was negligible for the L1 listeners, and the mean differences between the two groups were significant: 2.7% with a medium effect size ($p \leq .05$, $d = 0.67$) in the short sentences; 4.0% with a large effect size $p \leq .01$, $d = 0.90$) in the longer sentences.

Confusing whether the reduced auxiliary verb was a clitic to a pronoun or to a modal verb, does not necessarily mean that the sensory input at the perceptual level was misperceived, but it could mean that judgements about the perceptual input may have been overridden subsequently by selective attention at the perceptual report. Either way, this suggests that, for some L2 listeners, the echoic memory of the relevant parts of some of the sentences was either not created, or

was considerably less robust and with shorter duration than it was for the L1 listeners. As mentioned in point 2 above, L1 listeners reported that they had replayed relevant parts of sentences mentally which indicated a reliance on echoic memory. It would seem that L2 listeners were less able to rely on echoic memory to replay and check the relevant structures.

4. *L2 listeners made both errors of not 'hearing' the presence of functors and of 'hearing' illusory ones.*

L2 listeners also made illusory errors as well as 'not heard' errors. However, we did not find evidence across Studies 1 – 5 of top-down processing causing illusory morphemes in the way that we found some suggestive evidence of it for the L1 listeners. This does not deny that it was happening, just that we did not have any particular evidence that it was. Instead, as discussed in Chapter 2, the evidence from the studies led us to favour an explanation for illusory morphemes as being due to interference in judgement caused by carry-over of noise from other trials. However, some illusory errors may also have arisen because L2 listeners were not sure what they had heard and simply guessed wrongly.

5. *Even proficient L2 speakers of English had problems with functor recognition.*

The results from the preliminary study in Study 6, in which we compared the results of the four L2 case study participants with those of the participants from Studies 1, 2, 3 and 5, confirmed that even advanced and proficient L2 speakers recognise functors to a lesser extent than L1 speakers in spoken sentences.

Points 2 – 5 above align with findings by other researchers that L2 listeners are less able to recognise sub-lexical information than L1 listeners.

Considering points 2 -5 together, the findings show that L2 listeners, even at higher levels of proficiency, have a deficit in recognising functors in spoken sentences. We emphasise that our findings relate to higher level L2 speakers of English. Since L2 listeners are shown to be less able to recognise functors in spoken sentences than L1 listeners, these findings would align with those of other researchers who found that L2 listeners to English do not recognise function words and function morphemes to the extent that L1 listeners do, even listeners with higher levels of proficiency, and that L2 listeners rely much more on lexical-semantic cues and less on syntactic information than L1 listeners in sentence processing (e.g. Andringa et al, 2012; Clahsen & Felser, 2006a & 2006b; DeKeyser, 2005, Ellis 2006; Field, 2001, 2003 & 2008; Gor, 2010 & 2015; Han, 2003; Roussel et al, 2017; Trenkic, Mirkovic & Altmann 2014). Moreover, our findings could provide substance for Field's (2001) claim that the more skilled the L2 speakers become in listening in the target language, the more they have a tendency to engage in compensatory higher-level top-down cognitive processing strategies because, as our findings show, even advanced level L2 listeners have a deficit in functor recognition when listening.

6. *Functors may be more problematic for L2 listeners to recognise when they are weakly stressed and therefore perceptually less salient.*

In respect of perceptual salience: we found that L2 listeners were able to recognise the more perceptually salient functors articulated as separate syllables a little more easily in Studies 1 and 2. That is, the /ɪd/ articulation of the past tense *-ed* inflection and the /əv/ articulation of the reduced auxiliary verb *have*, proved a little easier for the L2 participants to recognise than the /d/, /t/ and /v/

articulations. In respect of the reduction of the auxiliary verb *have*, we also saw slightly better mean performances in Study 5 when the auxiliary was a clitic to a modal verb, and therefore a separate syllable, than when it was a pronoun clitic. Moreover, in Study 3, L2 listeners sometimes failed to accurately report the unstressed penultimate morpheme of adverbs. Such findings are in line with the claims by researchers, such as Dekeyser (2005), Ellis (2006b), Fernandez & Smith Cairns, (2011); Field (2008), Gor (2010) and Jiang (2004), amongst others, that functors may be problematic for L2 listeners to recognise due to weak stress.

7. *Whether a regular verb past tense inflection or a regular noun plural inflection was voiced or unvoiced seemed to make little difference to L2 listeners. However, whether the verb final sound or the noun final sound was voiced or unvoiced may have made a small difference in relation to illusory inflections.*

In Study 1, we did not find clear evidence that the voiced /d/ past regular verb past tense inflection was more or less difficult for the L2 listeners to recognise than the unvoiced /t/ inflection. We therefore re-visited this question in Study 4, where we tested for differences between voiced and voiceless articulations of the regular past tense *-ed* inflections and the regular plural *-s* inflections. However, in Study 4, we did not find significant differences between the ability to hear a voiced versus a voiceless past tense ending. Nor did we find differences between listeners' abilities to hear the plural *-s* inflection following a voiced or unvoiced sound.

Nevertheless, there was a small indication that the L2 listeners were more likely to hear an illusory past tense morpheme following a voiced verb final sound than following an unvoiced sound, but that they were more likely to hear an illusory plural morpheme after a voiceless than a voiced noun final sound. It is worth noting that the figures relating to illusory morphemes were very small, and

findings may not be duplicated if the same test were carried out with more trials and more participants. Nonetheless, it is of interest that a voiced final sound of a verb led to an illusory past tense ending being heard more than an unvoiced final sound did in Study 4, but the reverse was true for nouns where an unvoiced final sound was more likely than a voiced final sound to result in an illusory plural inflection. This was especially interesting given that the sentence contexts were constant. This finding may be worthy of a more detailed and systematic phonological investigation, but that is beyond the scope of this thesis.

8. *There was little evidence about differences for L2 listeners between processing inflections and processing clitics.*

In respect of differences between listeners' abilities to process inflections versus reduced auxiliary and modal verb clitics, we note that auxiliary verbs are free morphemes but it has been suggested in the literature that they may share similarities with bound inflectional morphemes when reduced into clitic form (e.g. S. R. Anderson, 2008). We did not set up a study in which we were able to compare these two categories of functor directly. However, both L1 and L2 listeners seemed to do a little better in Study 2 recognising reductions of the auxiliary verb 'have' than in Study 1 recognising past tense inflections, despite the greater cognitive demands of the task in Study 2. In Study 2, listeners were asked both to recognise the presence or absence of the reduced functor and also to recognise whether the auxiliary formed a pronoun or a modal verb clitic. In Study 4, we saw a difference between how accurately L2 listeners could recognise past tense verb inflections and plural inflections – 74.3% and 94.0% accuracy respectively. This difference may be due to the nature of the inflection. At the phonetic level, it should be noted that the fricative, sibilant /s/ and /z/ have a slightly longer duration and higher salience than the plosive /d/ or /t/ and this may

account for the -s inflection being more noticeable than the -ed inflection in this controlled context; moreover, the past tense ending is sometimes elided or unreleased in rapid connected speech whereas this is less likely with plural endings, and this could possibly contribute to a difference in perception of the endings (Ball, 2020). In Study 5 we saw a difference between how easily L2 listeners were able to recognise different auxiliary and modal verb reductions, with 'd (*had*) and 'v (*have*) attached to pronouns perhaps being the most difficult. From these findings, there is a little suggestive evidence that past tense inflected endings, when these are not elided but are articulated as /d/ or /t/, are perhaps a little more difficult for L2 listeners to notice in streams of connected speech than the other types of functor that we tested in this thesis. However, since the inflected /s/ and /z/ endings seemed to be much less problematic for listeners, it is not possible to judge whether inflections or clitics are more difficult for L2 listeners to process from a grammatical point of view. It would seem that each type of inflection or clitic needs to be considered on an individual basis rather than grouped paradigmatically.

Notwithstanding, in the sentence dictation tests in Studies 6 and 7, L2 listeners not infrequently wrote the clitics out in full, demonstrating that, at least some of the time, the clitics were perceived as separate words rather than as complex word endings.

9. *Deficits in hearing functors led to deficits in being able to reconstruct sentences for advanced and proficient L2 speakers.*

The findings from Studies 6 and 7 showed that deficits in hearing functors among L2 listeners can lead to deficits in the ability to reconstruct sentences that have been heard. This finding was not limited to intermediate level speakers of English

but was found among advanced and proficient communicators, some of whom had been residing in Britain and using, and hearing, English in their daily lives for several years.

10. *Sentence dictation tasks showed that most errors were related to functors.*

Apart from difficulties noticing reductions of auxiliary and modal verbs, particularly *have* and *had*, errors found in the sentence dictations for L2 listeners pre-training included:

- missing content words - this was not an issue for the L1 listeners;
- pronoun changes – this was a slight issue for the L1 listeners;
- difficulties noticing and reproducing perfect modal verb constructions (*would* followed by *have*, e.g. *they'd've visited*, or *they wouldn't 've visited*) – this in itself was not an issue for the L1 participants overall, although some of the participants replaced *have* with *of*, which is not an uncommon practice.

L2 listeners in both Studies 6 and 7 had considerable problems with 3rd conditional structures, and struggled to reproduce sentences - accuracy rates were much lower than those of the L1 listeners.

11. *Post-training results showed training had a positive effect on L2 listeners' abilities to recognise particular functors and also 3rd conditional grammar structures. Moreover, there was an improvement in how many words that listeners could accurately include in reconstructions.*

Training was shown to have a positive effect on L2 listeners' abilities to recognise functors and to reconstruct sentences after listening to them. In particular, we found improvements post-training in the following:

For the Study 6 participants, in the sentence dictation tasks, there were:

- Fewer missing content words
- A higher number of sentences reconstructed and reproduced in line with the ones that had been heard (more correct sentences)
- A higher number of past perfect constructions recognised correctly
- A higher number of the modal verb *would* recognised correctly
- A higher number of 3rd conditional structures recognised correctly

For the Study 7 participants, in the sentence dictation tasks, there were:

- Fewer missing content words
- A higher number of sentences reconstructed and reproduced in line with the ones that had been heard (more correct words)
- A higher number of past perfect constructions recognised correctly
- A higher number of perfect modal verb constructions recognised correctly
- A higher number of 3rd conditional structures recognised correctly

For the Study 7 participants, in the morpheme recognition tasks:

- A higher number of reduced auxiliary verbs *have* and *had* and perfect modal verb constructions *would have* were recognised correctly

We did not find improvements in the recognition of present perfect constructions in the sentence dictations tasks for either group.

We did find that some of the L2 participants in the sentence validation group (Study 6) and in the control group (Study 7) also showed some improvements in performance, despite not receiving training. For the Study 6 participants, this was only in terms of sentence dictations since they did not take any of the other tests; for the Study 7 participants small improvements were seen across all three parts of the final test. However, improvements were not seen in all aspects, nor for all participants. Furthermore, the mean level of improvements in all cases was lower than the mean levels of improvement for the case study participants.

These findings may indicate that the tests taken as final tests were slightly easier than the tests taken as initial tests, since participants without training performed a little better on average in the final tests. However, the findings might also indicate a priming effect, particularly for the control group in Study 7. In Study 7, the control group participants were exposed to all the linguistic elements and constructions that were being tested in the initial test, and it is possible that taking the initial test led to participants paying more attention to details in the final test, particularly if they experienced uncertainty in the initial test. Furthermore, in the case of Study 7 participants, the priming from the initial tests may have led the participants to pay more attention to reduced functors and 3rd conditional constructions produced around them in between the two tests. In this way, taking the initial test could have acted in a limited way as a form of training in noticing. In Study 6, the sentence dictation validation participants were given all 78 sentences from both the initial test and the final test in one session. While we did vary the order in which the sentences were given to the sentence validation group, regrettably, all the L2 participants were in sessions wherein the sentences were

given in the same order as they were to the case study participants. Thus, if a priming effect existed, this would have meant that the L2 sentence validation participants would perform better in the sentences given to the case study participants as their post-training test.

Nevertheless, the mean differences between initial and final tests for the trained case study participants far surpassed the mean differences for the non-trained participants in both Studies 6 and 7, and effect sizes were much larger for the case study participants in Study 6, showing that training did have a positive effect.

12. *Impact factors to consider in the training: listening and shadow-reading; articulation of functors; repetition of form and function within a variety of contexts; form-focused attention; comprehension of complex grammatical structures; variety of focus; number of sessions.*

Training varied a little between Study 6 and Study 7. At the beginning of both studies, participants were given a few explicit grammar exercises and practice on the surface form and uses of 3rd conditional sentences. Following this, all participants listened to sets of sentences, and listened to them again while reading them simultaneously. This pattern was repeated at least two or three times more with each set of sentences throughout the sessions. Training materials predominantly contained narratives about events in the past, including a number of 3rd conditional sentences. The intention with this was that participants would develop a functor-sound association, particularly in relation to weakly stressed bound morphemes and to reduced auxiliary and modal verbs articulated as clitics. In the initial part of the training, participants' attention was specifically drawn to past perfect structures, perfect modal verb constructions, and 3rd conditional structures.

In Study 6, participants were trained together as one group and received 10 separate hours of training. Their training constituted listening, followed by listening and shadow-reading. In Study 7, participants were trained individually and received fewer, but longer, training sessions (6 x 90 minutes) totalling 9 hours of training each. In addition to listening and shadow-reading, the Study 7 participants also practised reading some of the sentences aloud, which included specific practice in articulating weakly stressed and co-articulated functors. Moreover, the Study 6 participants spent a little time on discriminating /v/ and /w/ sounds as they had expressed interest in this. The Study 7 participants did not practise these sounds. Instead, they were given two additional sheets of training which included a focus on re-syllabification and linking, particularly in respect of the intrusive semi-vowels linking /r/, /j/, /w/, which the participants practised articulating aloud. Through articulation practice, the Study 7 participants then had their attention drawn to the surface form of co-articulation to a greater extent than the Study 6 participants.

We compared the results that we had from the two groups of case study participants that were common. These were: number of sentences with missing words, recognition of the reduction of 'had' denoting the past perfect, recognition of the 3rd conditional structure. The results are shown in Table 1 below.

Table 1. Comparison between case study participants in Studies 6 and 7. Results are also given for the untrained L2 participants. Results shown in % and given with standard deviations, standard errors of the mean, and Cohen's d effect sizes. The changes from the initial test → the final test are shown in italics above the mean difference.

Group	No. of sentences with missing content words	Correct identification of 'd (had) – past perfect	Correct structure given for 3 rd conditional
Study 6	<i>10.1 → 7.4</i>	<i>22.9 → 56.4</i>	<i>5.6 → 45.6</i>
Case study participants mean difference	- 2.7^{ns}	+ 33.5*	+ 40.0**
N = 3	SD = 2.54 SEM = 1.47 d = 1.06	SD = 8.55 SEM = 4.94 d = 3.89	SD = 2.82 SEM = 1.63 d = 14.18
Study 7	<i>17.5 → 8.9</i>	<i>10.7 → 40.0</i>	<i>5.5 → 40.5</i>
Case study participants mean difference	- 8.6^{ns}	+ 29.3**	+ 35.0**
N = 10	SD = 13.76 SEM = 4.35 d = 0.63	SD = 17.70 SEM = 5.60 d = 1.66	SD = 26.00 SEM = 8.22 d = 1.34
Untrained sentence validation L2 participants in Study 6	<i>4.2 → 1.3</i>	<i>37.5 → 59.2</i>	<i>19.8 → 30.8</i>
N = 5	- 2.9^{ns} SD = 5.28 SEM = 2.36 d = 0.55	+ 21.7* SD = 14.56 SEM = 6.51 d = 1.49	+ 4.5^{ns} SD = 11.56 SEM = 5.17 d = 0.39
Untrained control group in Study 7	<i>6.3 → 4.2</i>	<i>22.7 → 40.1</i>	<i>19.8 → 30.8</i>
N = 6	- 2.1^{ns} SD = 5.47 SEM = 2.23 d = 0.38	+ 17.4 * SD = 15.85 SEM = 6.47 d = 1.10	+ 11.0^{ns} SD = 15.26 SEM = 6.23 d = 0.72

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level.
^{ns} p > .05.

From the three sets of results that we were able to compare across the two studies, it seemed that the trained case study participants in Study 6 had made more progress than the trained case study participants in Study 7, since mean differences and effect sizes were larger between the initial and the final tests for the Study 6 participants. We therefore ran an independent samples t-test to analyse the differences between the two sets of improvements, along with a

Cohen's D test for effect sizes. Levene's test of variances showed that equal variances could not be assumed.

The differences between the means for improvements were:

- sentences with missing words: 11.3%; SEM = 4.60, $p \leq .05$, $d = 0.60$
- hearing the reduced 'had' auxiliary verb: 4.0%; SEM = 7.46, $p \geq .05$, $d = 0.29$
- hearing the 3rd conditional structure: 4.2%; SEM = 8.37, $p \geq .05$, $d = 0.23$

Therefore, the Study 6 participants improved significantly more than the Study 7 participants only in respect of missing words but only with a medium effect size. As such, we do not have enough evidence to suggest that either training approach was more effective than the other. In both studies, the trained participants improved significantly more overall than the untrained participants. We would have expected the case study participants in Study 7 to improve more than those in Study 6, because they had individual training, training in more types of co-articulation, and an opportunity to articulate (and thereby practise) the surface forms of sentences and a variety of co-articulation types. However, there are four points to bear in mind when comparing the training of the two groups. Firstly, the three Study 6 participants had a mean level of proficiency in English equivalent of IELTS 8.0, whereas the mean level of proficiency for the Study 7 participants was equivalent to IELTS 6.8. Whether this played a role in improvement rates, we do not know, but it is a possibility. Secondly, the three Study 6 participants who completed the final test, all practised articulating some of the structures and co-articulations very softly to themselves so, in fact, they did also have some practice in articulation. Thirdly, given there were only 6 training sessions, we may have over-burdened the Study 7 participants through practising too many types of co-articulation. It might have been more worthwhile to focus on recognising fewer types of modifications. Fourthly, both groups had roughly equal amounts of

practice listening to, and listening and reading, 3rd conditional structures, and both groups made large improvements in respect of being able to recognise and reconstruct this structure in the final test. As shown above, there was no real difference between the mean improvement shown between the two groups in respect of 3rd conditional structures.

13. Levels of accuracy in performance were not strongly correlated with either language levels nor with time spent in the UK.

Finally, in Studies 1 – 5, we tested for correlations between L2 listeners' language levels and accuracy levels, and we also tested for correlations between the approximate amount of time L2 listeners had spent in the UK and their accuracy levels. We found some evidence of a positive correlation between level of proficiency and accuracy and between time spent in the UK and accuracy. However, we also found that some of the higher level participants performed less accurately than some of the lower level participants, and that some of the people who had spent more time in the UK did not perform as accurately as some of those who had spent less time here. The lack of positive correlation was again seen in the findings from Study 6, where participant 904 performed less accurately than some of the lower level participants from Studies 1 – 3, despite having a higher English language level and having spent more time in the UK.

Aims, hypotheses and research questions

The aims of the thesis were threefold: to investigate the extent to which L2 listeners to English are able to accurately recognise functors when listening to sentences; to

investigate possible differences between L2 listeners and L1 listeners in respect of being able to recognise functors; to investigate whether it is possible to positively affect the ability of L2 listeners to recognise and utilise functors in sentences. These aims were achieved through the seven studies that were conducted.

From the results of the seven studies, we are now able to answer the four research questions of the thesis as follows:

Research question 1: Can, and to what extent do, L2 listeners hear and recognise reduced functors?

As shown through the studies, L2 listeners can hear and recognise reduced functors but there are deficits both in their ability to recognise the presence or absence of the functors, and deficits in their ability to correctly identify what the functor is when given a choice of possible functors.

Research question 2: Are there differences in the abilities of L2 listeners and L1 listeners to recognise reduced functors in focused listening tasks?

Yes. L1 listeners made very few errors overall. L2 listeners made significantly more, although they were still able to perform with accuracy to a larger extent in the morpheme recognition tasks. L1 listeners seemed to be able to mentally replay sentences to check for surface form, but L2 listeners showed much less ability in this respect. Moreover, L2 listeners seemed more affected by cognitive load than did L1 listeners.

Research question 3: What can we learn from the studies about L2 listeners' abilities in respect of functors?

The L2 listeners in our studies had gaps in respect of hearing functors. They further misidentified some of the functors that they did hear. The evidence therefore points to a lack of robust sound-form-function association which may be found even among advanced and proficient speakers of English. It is difficult to see how this sound-form-function association will become more robust given the gaps and misidentifications unless facilitation occurs.

Research question 4: Can we find techniques to improve L2 listeners' abilities in respect of processing functors and utilizing them in sentence reconstructions?

Yes. The case study participants in Studies 6 and 7 showed signs of improvements in functor recognition in respect of recognising reduced auxiliary verbs and reduced modal verbs after a few hours of training. Moreover, they also all showed improvements in recognising, and in being able to reconstruct, 3rd conditional structures after a little explicit practice, some form-function focused training and a considerable amount of implicit training.

In respect of the three hypotheses:

Hypothesis 1: L2 listeners will show a deficit in recognising functors accurately compared with L1 listeners even in focused tasks.

Hypothesis 2: Deficits in recognising functors accurately while listening will lead to issues for listeners in reconstructing the sentences that they listen to.

Hypothesis 3: Training can positively affect the ability of L2 listeners to recognise and utilise functors in sentences.

The evidence clearly shows that all three hypotheses were supported.

Wider implications

The findings from this thesis have wider implications for three particular areas: firstly, in respect of the implicit-explicit debate on second language acquisition; secondly, in respect of language teaching; and thirdly, in respect of psycholinguistic research into bilingual sentence processing.

The implicit-explicit debate

The findings from the studies in the thesis are of particular interest for the implicit-explicit discussion on second language acquisition, explained in Chapter 1.

Firstly, given the number of errors made by the L2 listeners with higher levels of English proficiency, there is some clear evidence that bottom-up processes of listening (that is, listening at the perceptual levels) do not ‘take care of themselves’ as language learners develop their language levels, as was suggested by, for instance, Ridgeway (2000) and in the research discussed by Renyanda and Farrell (2011). Moreover, we did not find clear evidence that higher levels of English proficiency, nor longer length of time spent in the UK, were strongly and positively correlated with levels of accuracy. In fact, we found an opposite result in Study 4.

Secondly, we have in mind the poignant comment by one of the case study participants in Study 6, whose English language level was both deemed advanced and proficient in line with CEFR descriptors, and who had been living and working in the UK for nine years. After he had completed roughly three quarters of the training, he commented that he could now hear 3rd conditional sentences in his daily life and was surprised by how frequently native speakers of English used them. Clearly he had needed explicit instruction, together with form-focused listening training, and the repetition of examples to become aware of 3rd conditional structures and of how they are used. Further to this, we also have the comments from case study participants in Study 7 (as recorded in their final self-assessment evaluation sheets) that training helped them to understand functors and to segment words better when they listened outside the training sessions. Thus, L2 listeners' own assessments provide evidence that form-focused and repetitive training facilitated improvements in their listening comprehension.

Thirdly, we found some evidence that L2 listeners could not accurately identify functors when they did notice the presence of a functor. This means that listeners may be building up patterns of sounds that they cannot utilise correctly or, in worst case scenario, that interfere with their ability to understand the surface form of the sentences, particularly in relation to complex structures. Such incomplete patterns of surface form structure may lead to discrepancies in language nuances, particularly in relation to tense, aspect and modality, and are likely to contribute to issues of fossilization. Fossilisation is defined by Segalowitz (2003:387) as “ ‘fluent’, robust habits of incorrect speech” produced by speakers. Through the findings of this thesis, we suggest that many fluent and high-level L2 listeners not only have ‘robust habits of incorrect speech’ but also have robust habits of incorrectly *hearing* speech when listening.

These three points taken together show that L2 English speakers, even with higher levels of English proficiency, are unlikely to develop their listening skills accurately in respect of functors and more complex grammatical structures without some form-focused

instruction. This form-focused instruction needs to be integrated with listening practice, and it needs to focus listeners' attention at the perceptual level while they are listening. At the perceptual level of functor recognition, intensive and form-focused listening, with some explicit instruction, seems to be essential. This is true too for complex grammatical structures which depend on functors. These findings support the claims by Schmidt (1990, 2010) that an additional language cannot simply be implicitly absorbed from the input without receiving attention, and that input needs to be consciously registered for it to become intake. The findings further support the claims by Beckner et al (2009:11) of The Five Graces group that **without explicit instruction** directing L2 learners' attention to the functors in the input, a high proportion of adult language learners would have irregular gaps in their comprehension of language and would not achieve high levels of sophistication in their production of speech.

Language teaching

As Han (2003) said, language learners may become fluent and effective communicators but continue to make the same language errors even if their attention is drawn to such errors and they have a great deal of exposure to 'correct' forms of the language. Error correction is a common practice in language teaching classrooms, but most language teachers would accept that, no matter how many times they correct certain errors in learners' production (spoken or written), learners continue to produce the same errors.

In order to develop language abilities in respect of morpho-syntax, it is clear that it is helpful for L2 learners to receive explicit instruction so that they can understand both the surface form and the related function. As discussed previously, it is difficult to notice form implicitly when engaged in listening for meaning. The current practices of the communicative language teaching approach, which focus on meaning and fluency, help

learners to develop fluency, but seem to fall short when it comes to entrenchment of morpho-syntactic cues and cues of complex grammatical structures which are dependent on morpho-syntax.

Usage-based theories of language learning highlight that language is learnt through frequent repetitions which help to entrench linguistic elements and grammatical constructions in the mind. Langacker (1987:57), for instance, explained that as individuals are exposed to repeated use of a linguistic structure, the structure becomes increasingly more strongly entrenched in the mind, and repetition and rehearsal increase the strength of representation; moreover, repeated use of linguistic structures causes them to be processed as holistic units rather than as a collection of single elements. Repetition and rehearsal are important components of language acquisition, and, we suggest, are equally important for developing automatic processing of language input. Yet Ellis (2006a) and Han (2003) both comment that functors are frequent in the input, but frequency alone does not seem to guarantee their acquisition. The results from Studies 6 and 7 in this thesis did not show training to have an effect on L2 listeners' abilities to recognise the reduced auxiliary verb *have* in present perfect constructions, and thus this thesis concurs with the claims by both Ellis and Han that frequency and context alone are not enough to thoroughly entrench functors. Ellis (2006a) puts forward the suggestion that L2 learners' difficulties stem from issues with psychological salience and low outcome importance - that is, people do not notice the form and its related function because it does not register as important - and because there are issues with contingency in relation to expectations of what is likely. Issues with contingency mean listeners do not anticipate what is coming next. Rost (1994) points out that processes of listening are dependent on the listener being able to anticipate what is to come and to infer what has been said, since the listener does not process the sounds of language as quickly as they are produced. There is a deficit in listeners' perception of the incoming data, and the gaps left by this deficit are filled in through the interplay between bottom-up and top-down processes. However, such gap-filling can only occur at the perceptual level if listeners know what they could

have expected to hear. Such comments would indicate that at the surface form level of language, it would therefore seem that for listeners to hear what is said, they need to know what could have been said.

The findings from this thesis highlight the difficulties that L2 listeners have with accurate mapping of the form of functors onto their functions in sentences. These difficulties involve both knowledge of sound-form-function associations and the ability to process the sound-form-function associations when listening. Case study participants showed surprise at the various co-articulations that they were shown during training, despite the fact that their English language levels ranged from the equivalent of IELTS 6.5 to 8.5. They seemed to have no recollection of having received classroom training previously in such co-articulations. This may not be surprising because as stated by a number of researchers (e.g. Field, 2008; Vandergrift, 2007), the ELT (English language teaching) classroom tends to focus on the product of listening rather than on how language input is processed. As this thesis shows, L2 listeners have a deficit in being able to **notice** the forms of functors and their associated function in the language input and to do this with conscious attention. Both the knowledge and the processing skills seemed to be deficient. This thesis emphasises that this ability needs to be developed in L2 listeners, and the thesis proposes that in order to do so, noticing and attention need to be focused at three levels. First, the listener must be able to recognise the co-articulated and weakly stressed sounds as the functors they represent. Second, the listener must notice the presence and the position of the functor in the surface form of the sentence. Third the listener must understand the functor's function in the sentence. Only then can noticing and conscious attention lead to robust entrenchment through repetition. This thesis suggests that a dynamic way forward would be to focus more on sound-form-function associations through listening practice in the classroom, with a particular focus both on sound-form at the perceptual level, including the various forms of co-articulation that are found in English, and a focus on function so that the form-function association becomes psychologically salient and relevant.

The recommendation of this thesis is then that language classrooms should adopt an approach that focuses not mainly on the product of listening, but also focuses on the processes of listening through sound-form-function associations for words and for morpho-syntactic structures. Sufficient practice might then lead to more automatic processing of morpho-syntax and may further render complex grammatical structures, such as 3rd conditional structures, to be processed as whole units.

Psycholinguistic research into bilingual sentence processing

An important area of psycholinguistic research into bilingual sentence processing includes investigations into similarities and differences between L1 and L2 parsing strategies, in particular on such strategies as minimal attachment, and on the processing of relative clauses and garden-path sentences. The findings of this thesis highlight the need for researchers not only to investigate strategies, but also to take into consideration that L2 listeners may not, in fact, be processing all the function words and functional morphemes in sentences under investigation. Relative pronouns used in relative clauses (as opposed to ones used as wh-question words where they become more salient) are usually considered as function words and are not infrequently weakly stressed and co-articulated. If an investigation using an audible phrase such as, *Someone shot the servant of the actress who was on the balcony* is attempting to ascertain whether listeners assume it was the servant or the actress on the balcony, it would be useful to consider whether the L2 listener had fully processed the whole sentence. Due to weak stress and co-articulation, it is possible that the sentence an L2 listener in fact heard may have been similar to, *Someone shot servant Fee ... actress Sue was on balcony*.

Finally, we re-visit the two main reasons proposed in the literature for L2 listeners' limitation in processing spoken language: that learners (late learners in particular) do not

have access to certain aspects of universal grammar that were available to them when they learnt their L1 and are therefore unable to develop competence in the new grammar fully (representational deficit), or that lack of accuracy is caused by difficulties individuals have in mapping abstract grammar to surface forms of morphemes (processing deficit) (Jiang, 2004; Morgan-Short, Sanz, Steinhauer & Ullman, 2010; Trenkic, 2007). This thesis has provided some evidence that would support the second view.

Limitations: The studies in the thesis had a number of limitations.

1. We did not control strictly enough for confounding variables. Firstly, we did not control for all aspects of co-articulation and their effects on performance. Secondly, we did not control for L1-effects on sentence processing, word recognition, morpheme recognition, nor, importantly on similarities of grammatical constructions. It would have been interesting to investigate all of these, but it was beyond the scope of this thesis.
2. We did not include a control group in Study 6. Since the case study participant numbers were small, and the group had an individual dynamic among participants, it would have been difficult to find a commensurate group that would have committed themselves to the two sets of tests, and so we did not attempt this. Instead, we made comparisons between the case study participants and a small group of five L2 sentence validation participants, whose participation was random, and for whom we did not control for language abilities nor for first languages. The sentence validation group (L1 and L2 participants) completed the sentence dictation tests in one session, unlike the case study participants for whom the sentences were split between a pre-training test and a post-training test, and therefore the test conditions were different for the sentence dictation validation

participants. We do not know what effect the different test conditions may have had, and whether the small improvements the validation group L2 participants showed was due to a priming effect.

3. The control group in Study 7 was small, and the percentage of very high language performers was higher in this group than in the case study group. Although the two groups were similar, they were not completely commensurate.
4. Since Studies 1 – 5 were not commensurate in terms of design and tasks, comparisons could not be made between L2 listeners' abilities to process different types of functor.
5. We did not set out to investigate modality from the outset. It was not until the results of the initial sentence dictation test in Study 6 showed the considerable difficulty of participants in respect of 3rd conditional sentences, that these became of particular interest. Therefore, the design of the methods in Study 6 was not controlled as carefully as it could have been, since it evolved from the initial test. This has a small carry-over effect on Study 7.
6. A further limitation of Study 6 is that we did not investigate listeners' comprehension of 3rd conditional sentences. It would have been interesting to know whether they understood the meaning of the sentences despite being unable to recognise some of the functors or to reconstruct (reproduce) the form. Therefore, we set up an E-Prime test of comprehension in Study 7. For this, we spent considerable effort checking that the 3rd conditional sentences were plausible and that we had included four samples of every combination – 'if' clause followed by main clause and vice versa, sentences oriented towards 'if' clause or main clause, each clause containing *not*, and so on. As these combinations resulted in 64 test items, we did not include additional items that were not 3rd

conditional sentences. The pilot study ran smoothly and the test seemed to work well. Some of the participants in Study 7 completed the E-Prime comprehension test diligently. Unfortunately, we discovered during the actual testing sessions that other of the participants had found a strategy for bypassing comprehension and only looking for key words. While the results for accuracy were deemed reliable, the results for reaction times became invalid.

Recommendations for further studies: Based on the studies of this thesis, we recommend two further studies.

First: Studies in the thesis provided some interesting insights into the deficits of L2 functor recognition in English. In Study 7, we additionally set up an E-Prime test to investigate how well L2 listeners could comprehend third conditional sentences despite deficits in the ability to recognise relevant functors and to reproduce such sentences. This was done to test whether L2 listeners were able to create usable mental models of sentences even though they might have issues with surface form reconstructions. This test seemed to work well in a pilot study, but when we delivered the test to the case study participants and to the control participants, we discovered a flaw: some of the participants responded based on techniques they had devised rather than based on processing the sentences. It would be interesting for a follow-on study to investigate the extent to which deficits in morpheme recognition and surface-form re-constructions actually affect listeners' abilities to comprehend the sentences. Such a follow-on investigation should include two tasks: morpheme recognition and sentence dictations. The sentences from the two tasks should be mixed together in a random order, and should include a variety of types of sentence to prevent listeners from devising patterns of response techniques. Each sentence for both types of task should be followed rapidly by an appropriate comprehension question. In

this way, a listener's abilities would be tested for morpheme recognition, sentence reconstructions, and comprehension.

Second: It would be useful to conduct further studies to put training approaches to the test. Such further studies should work with a more limited set of variables, i.e. fewer training items, so that these can be controlled more rigorously. Pre- and post-training tests could then be focused specifically on the limited set of items. Sentence dictations in Studies 6 and 7 of this thesis were designed to be fairly open, so that we could see what kind of issues arose, but the issues of most interest were in fact quite limited. (The openness of the design in fact meant that some variables were not investigated.) Building on Studies 6 and 7, further studies could, for instance, just focus on the use of the past perfect construction, or on modal perfect constructions, or on intrusive semi-vowels. As mentioned, training participants in Study 7 on more aspects of co-articulation than in Study 6, did not lead to greater levels of improvement in word recognition. Therefore, a focus on limited variables may prove more fruitful.

As stated above, the evidence from this thesis suggests that robust entrenchment, which leads to automatic processing, is likely to be underpinned by three things: the listener recognising co-articulated and weakly stressed sounds as the functors they represent; the listener noticing the presence and the position of the functor in the surface form of the sentence; the listener understanding the functor's function in the sentence. It would be interesting to compare three approaches to training based on these three things. Thus the first training approach could focus on listeners noticing the reduced articulations of chosen linguistic functors or structures; the second training approach could present participants with not just reductions and co-articulations but additionally present the full version of the reduced functors alongside – in this way listeners would not, for instance, confuse the /d/ of *had* with the /d/ of *would*; the third training approach could be the same as the second but further include comprehension checks on the function of the functors or grammatical structures.

Conclusion

This thesis has provided some clear evidence that L2 listeners with higher levels of proficiency have a deficit in their ability to notice and to recognise functors when listening to spoken sentences. Therefore, listeners cannot be assumed to develop their ability to process and use morpho-syntax through natural exposure to the target language, nor even through classroom exposure that focuses mainly on the product of listening rather than the processes of listening. Firstly, listeners may not associate the sounds of co-articulated functors with their full version, and thus listeners need to be trained to recognise the sounds of weakly stressed and reduced functors for what they are. Therefore, frequency of input alone is unlikely to lead to developments in the ability to recognise functors when listening. Secondly, for listeners to develop their ability to recognise functors and grammatical structures, these need to be made psychologically salient through an understanding of function and of the relevance of that function. After this, repetition and rehearsal may prove to be an effective way of mentally entrenching morpho-syntax through sound-form-function associations. Consequently, future auditory exposure will be psychologically salient and based on expectations, which are underpinned by knowledge of grammar and knowledge of the phonology of grammar. This thesis concludes that the reason for L2 listeners' issues with morpho-syntax is related to processing difficulties in mapping surface forms of morphemes to grammar and in mapping grammar to surface forms of morphemes.

References

- Aarts, B. (2013). *English Syntax and Argumentation*, 4th edition. UK: Palgrave MacMillan.
- Akker, E. & Cutler, A. (2003). Prosodic cues to semantic structure in native and non-native listening. *Bilingualism: Language and Cognition* Vol 6 (2), 81-96.
- Alamri, W.A. (2018). Communicative Language Teaching: Possible Alternative Approaches to CLT and Teaching Contexts. *English Language Teaching*, 11(10). Published online September 2018. doi: 10.5539/elt.v11n10p132.
- Altenberg, E.P. (2005). The perception of word boundaries in a second language. *Second Language Research* 21(4), 325-358.
- Ambridge, B., Bidgood, A., Twomey, K.E., Pine, J.M., Rowland, C.F., & Freudenthal, D. (2015). Preemption versus entrenchment: towards a construction-general solution to the problem of retreat from verb argument structure over-generalization. *PLoS One* 10(4): doi: 10.1371/journal.pone.0123723.
- Ambridge, B., Kidd., Rowland, C.F. & Theakston, A.L. (2015). The ubiquity of frequency effects in first language acquisition. *Journal of Child Language*, 42(2), 239-273. doi: 10.1017/S030500091400049X.
- Anderson, J.R. & Lebriere, C. (1998). *The Atomic Components of Thought*. Mahwah, New Jersey: Lawrence Erlbaum Associates.
- Anderson, S.R. (2008). English reduced auxiliaries really are simple clitics. *Lingue e Linguaggio*, 7(2), 169 -186. Retrieved from <https://www.rivisteweb.it/doi/10.1418/28094>.

- Andringa, S., Olsthoorn, N., van Beuningen, C., Schoonen, R. & Hulstijn, J. (2012). Determinants of success in native and non-native listening comprehension: an individual differences approach. *Language Learning*, 62(s2), 49-78.
- Ashby, P. (1995). *Speech sounds*. London: Routledge.
- Ashby, M. & Maidment, J. (2005). *Introducing Phonetic Science*. Cambridge, UK: Cambridge University Press.
- Bakker, I., MacGregor, L.J., Pulvermüller, F. & Shtyrov, Y. (2013). Past tense in the brain's time: neurophysiological evidence for dual-route processing of past-tense verbs. *Neuro Image*, 71, 187-195.
- Ball, M.J. (2020). Personal communication. University of Sussex, online. 22 May, 2020.
- Bates, E. & MacWhinney, B. (1981). Second language acquisition from a functional perspective: pragmatic, semantic and perceptual strategies. In Winitz, H. (ed.), *Native Language and Foreign Language Acquisition*, pp 190-214. New York: New York Academy of Sciences.
- Beckner, C., Blythe, R., Bybee, J., Christiansen, M.H., Croft, W., Ellis, N., Holland, J., Ke, J., Larsen-Freman, D. & Schoenemann, T. (2009). Language is a complex adaptive system: a position paper. *Language Learning*, 59, Supplement 1, 1 -26.
(Also referenced under: The Five Graces Group.)
- Behrens, H. (2009). Usage-based and emergentist approaches to language acquisition. *Linguistics*, 47(2), 383-411.

- Bencini, G.M.L. & Goldberg, A.E. (2000). The contribution of argument structure constructions to sentence meaning. *Journal of Memory and Language* 43(4), 640-651.
- Bever, T.G. (1970). The cognitive basis for linguistic structures. In Hayes, J.R. (Ed.), *Cognition and the development of language*. New York: Wiley.
- Blake, B.J. (2008). *All about language*. Oxford, UK: Oxford University Press.
- Blank, I., Balewski, Z., Mahowald, K., & Fedorenko, E. (2016). Syntactic processing is distributed across the language system. *NeuroImage*, 127, 307-323. <https://doi.org/10.1016/j.neuroimage.2015.11.069>.
- Bock, J.K. & Levelt, W.J.M. (1994). Language production: grammatical encoding. In M. A. Gernsbacher (Ed), *Handbook of psycholinguistics* (pp 945-984). San Diego, CA: Academic Press.
- Bosker H.R., Reinisch, E. & Sjerps, M.J. (2017). Cognitive load makes speech sound fast, but does not modulate acoustic context effects. *Journal of Memory and Language*, 94, 166-176.
- Buck, G. (1995). How to become a good listening teacher. In D. Mendelsohn & J. Rubin (Eds.), *A Guide for the Teaching of Second Language Listening*. San Diego, CA: Dominie Press Inc.
- Butterworth, B. (1983). Lexical representation. In Butterworth, B (Ed), *Language production*, Vol 2, pp 257 -294. London: Academic Press.

- Bybee, J.L. (1985). *Morphology: A study of the relations between meaning and form*. Amsterdam, N.L. & Philadelphia, U.S.A.: John Benjamins.
- Bybee, J.L. (2006). From usage to grammar: the mind's response to repetition. *Language*, 82(4), 711-733.
- Carramazza, A. (1997). How many levels of processing are there in lexical access? *Cognitive Neuropsychology*, 14, 177-208.
- Carramazza, A. & Miozza, M. (1997). The relation between syntactic and phonological knowledge in lexical access: Evidence from the "tip-of-the-tongue" phenomenon. *Cognition*, 69, pp 309-343.
- Celce-Murcia, M.; Brinton, D.M. & Goodwin, J.M. (1996). *Teaching pronunciation – a reference for teachers of English to speakers of other languages*. Cambridge, UK: Cambridge University Press.
- Chang, A.C.S. & Millett, S. (2014). The effect of extensive listening on developing L2 listening fluency: some hard evidence. *ELT Journal*, 68(1), 31-40. Retrieved from <https://doi-org.ezproxy.sussex.ac.uk/10.1093/elt/cct052>.
- Chenu, F. & Jisa, H. (2009). Reviewing some similarities and differences in L1 and L2 lexical development. *Acquisition et Interaction en Langue Etrangere*, 1, 17-38. Online at <https://journals.openedition.org/aile/4506>. (accessed 15/2/15).
- Clahsen, H. (1999). Lexical entries and rules of language; a multidisciplinary study of German inflection. *Behavioural and Brain Sciences*, 22, 991-1060.

- Clahsen, H. & Felser, C. (2006a). Continuity and shallow structures in language processing. *Applied Psycholinguistics*, 27, 107-126.
Doi:10.1017.S0142716406060206.
- Clahsen, H. & Felser, C. (2006b). How native-like is non-native language processing? *Trends in Cognitive Sciences*, 10(12), 564-570.
- Clahsen, H & Felser, C. (2006c). "Grammatical processing in language learners". *Applied Psycholinguistics*, 27, 3-42. Cambridge University Press.
- Clark, E.V. & Clark, H.H. (1979). When nouns surface as verbs. *Language*, 55, 767-811.
- Collins, B.S. & Mees, I.M. (2008). *Practical Phonetics and Phonology: a resource book for students*, 2nd edition. Oxfordshire, U.K. & New York, U.S.A.: Routledge.
- Cook, G. (2003). *Applied linguistics*. Oxford, U.K.: Oxford University Press.
- Cutler, A. (2005). Lexical stress. In Pisoni, D.B. & Remez, R.E. (eds.), *The handbook of speech perception*, pp 264-289. Oxford: Blackwell.
- Cutler, A. & Butterfield, S. (1992). Rhythmic cue to speech segmentation: evidence from juncture misperception. *Journal of Memory and Language*, 31, pp 218-236.
- Cutler, A., Mehler, J., Norris, D. & Segui, J. (1986). The syllable's differing role in the segmentation of French and English. *Journal of Memory and Language*, 25, 385-400.

- Darcy, I., Dekydsprotter, L., Sprouse, R. A., Glover, J., Kaden, C., McGuire, M., & Scott, J. HG. (2012). Direct mapping of acoustics to phonology: On the lexical encoding of front rounded vowels in L1 English-L2 French acquisition. *Second Language Research*, 28(1), pp 5-40.
- De Bot, K., Lowie, W. & Verspoor, M. (2005). *Second Language Acquisition*. London & New York: Routledge.
- De Haan, F., (2002). Strong Modality and Negation in Russian, in Reppen, R., Fitzmaurice, S. & Biber, D. (Eds) *Using Corpora to Explore Linguistic Variation*, Chapter 5, 91-110. <https://doi.org/10.1075/scl.9.07haa>.
- De Saussure, F. (1974). *Course in general linguistics*. London: Fontana. Original version published in 1915.
- De Sousa, L.B. & Gabriel, R. (2015). Does the mental lexicon exist? *Revista de Estudos da Linguagem*, 23(2) 335 – 361. Belo Horizonte. Retrieved online at doi: 10.17851/2237.2083.23.2.335-361.
- DeKeyser, R.M. (1996). Exploring automatization processes. *TESOL Quarterly*, 30(2), 349-357. Doi:10.2307/3588151.
- DeKeyser, R. (1997). Beyond explicit rule learning: automizing second language morphosyntax. *Studies in Second Language Acquisition*, 19, 195-222.
- DeKeyser, R.M. (2005). What makes learning second-language grammar difficult? A review of issues. *Language Learning*, 55(s1), 1-25.

- Dell, G.S. (1986). A spreading-activation theory of retrieval in sentence production. *Psychological Review*, 93, 283-321.
- Deng, T., Dunlap, S. & Chen, B. (2017). Effects of input training on second language syntactic representation entrenchment. *International Journal of Bilingualism*, 2017 (21 - 1), 3–20.
- Ellis, R. (1988). The effects of linguistic environment on the second language acquisition of grammatical rules. *Applied Linguistics*, 9(3), 257-274.
doi:/10.1093/applin/9.3.257.
- Ellis, N.C. (2002). Frequency effects in language processing: a review with implications for theories of implicit and explicit language acquisition. *Studies in Second Language Acquisition*, 24(), pp 143-188. Doi: 10.1017.S0272263102002024.
- Ellis, N.C. (2006a). Language acquisition as rational contingency learning. *Applied Linguistics*, 27, 1–24.
- Ellis, N.C. (2006b). Selective Attention and Transfer Phenomena in L2 Acquisition: Contingency, Cue Competition, Salience, Interference, Overshadowing, Blocking, and Perceptual Learning. *Applied Linguistics*, 27(2), 164–194.
doi:10.1093/applin/aml015.
- Ellis, N., & Larsen-Freeman, D. (2009). Constructing a second language: analyses and computational simulations of the emergence of linguistic constructions from usage. *Language Learning*, 59, Supplement 1, 90-125.

- Ellis, N.C., O'Donnell, M.B. & Römer, U. (2015). Usage-based language learning. In MacWhinney, B. & O'Grady, W. (eds), *The handbook of language emergence*, chapter 7, pp 163-180. Chichester, U.K.: John Wiley & Sons.
- Elman, J.L. (2004). An alternative view of the mental lexicon. *Trends in Cognitive Sciences*, 8(7), 301-306.
- Eysenck & Brysbaert, (2018). *Fundamentals of Cognition*, 3rd edition, Routledge.
- Fernandez, E.M. & Smith Cairns, H. (2011). *Fundamentals of Psycholinguistics*. USA & UK: Wiley-Blackwell.
- Ferreira, F. (2003). The misinterpretation of non-canonical sentences. *Cognitive Psychology*, 47, 164 – 203.
- Ferreira, F., Ferraro, V. & Bailey, K.G.D. (2002). Good-enough representation in language comprehension. *Current Directions in Psychological Science*, 11, 11 – 15.
- Ferreira, F. & Engelhardt, P.E. (2006). Syntax and production. In M. J. Traxler & M. A. Gernsbacher (Eds), *Handbook of psycholinguistics 2nd edition*, (pp 61-91). London & Reading, UK: Academic Press.
- Field, J. (2001). Finding one's way in the fog: listening strategies and second-language learners. *Modern English Teacher*, 9, 29-34. doi:10.1093/elt/52.2.110.
- Field, J. (2003). Promoting Perception: lexical segmentation in L2 listening. *ELTJ Journal*, 57(4), 325 – 334.
- Field, John. (2005). *Language and the Mind* London and New York: Routledge.

Field, J. (2008). *Listening in the Language Classroom*. Cambridge, UK: Cambridge University Press.

Flowerdew, J. & Miller, L. (2005). *Second Language Listening: Theory and Practice* Cambridge: Cambridge University Press.

Garnham, A. (1981). Mental models as representation of text. *Memory and Cognition*, 9(6), 560-565.

Garnham, A. (1982a). *On-line construction of representations of the content of texts*. Bloomington, Ind.: Indiana University Linguistics Club.

Garnham, A. (1982b). Testing psychological theories about inference making. *Memory and Cognition*, 10(4), 341-349.

Garnham, A. (1985). *Psycholinguistics: Central Topics* London & New York: Routledge.

Garnham, A. (1987). *Mental models as representations of discourse and text*. Chichester: Ellis Horwood.

Garrett, M.F. (1975). The analysis of sentence production. In G. H. Bower (Ed), *The psychology of learning and motivation: advances in research and theory, Vol IX*, (pp 133 – 177), New York: Academic Press.

Garrett, M.F. (1980). Levels of processing in sentence production. In B. Butterworth (Ed.), *Language production, Vol I*, (pp 177 – 220), New York: Academic Press.

- Gonnerman, L.M., Seidenberg, M.S. & Andersen, E.S. (2007). Graded semantic and phonological similarity effects in priming: evidence for a distributed connectionist approach to morphology. *Journal of Experimental Psychology: General*, 136, 323-345.
- Gor, K. (2010). Beyond the obvious: Do second language learners process inflectional morphology? *Language Learning*, 60(1), 1 – 20.
- Gor, K. (2015). Phonology and morphology in lexical processing. In J. W. Schweiter (Ed.) *The Cambridge Handbook of Bilingual Processing*, (pp 173-199). Cambridge: Cambridge University Press.
- Grosjean, F. (2013). Speech perception and comprehension. In Grosjean, F. Ping, L. & Bialystok, E. (Eds.), *The Psycholinguistics of Bilingualism*, (pp 25-39). Hoboken, N.J.: John Wiley & Sons.
- Gupta, P. & Dell, G. (1999). The emergence of language from serial order and procedural memory. In MacWhinney, B. (Ed.), *The emergence of language*, pp 447-481. Mahwah, N.J., U.S.A: Lawrence Erlbaum.
- Han, Z. (2003). Fossilisation: from simplicity to complexity. *International Journal of Bilingual Education and Bilingualism*, 6(2), 95-128.
- Han, Z. (2004). *Fossilization in Adult Second Language Acquisition*. Multilingual Matters.
- Hansen, B. (2005). How to measure areal convergence: a case study of contact-induced grammaticalization in the German-Hungarian-Slavonic contact area. In Hansen, B. & Karlík, P. (eds.), *Modality in Slavonic Languages. New Perspectives*. München, Germany: Verlag Otto Sagner.

- Harley, T.A. (2008). *The Psychology of Language: from data to theory*, 3rd edition. Hove, Sussex: Psychology Press.
- Hopper, P.J. (1987). Emergent grammar. *Berkeley Linguistics Society* (13), pp 139-157.
- Ibbotson, P. (2013). The scope of usage-based theory. *Frontiers in Psychology*, 4 (article 255), May 2013. Accessed online at www.frontiersin.org. doi:10.3389/fpsyg.2013.00255.
- Jiang, N. (2004). Morphological insensitivity in second language processing. *Applied Psycholinguistics*, 25, 603–634. doi: 10.1017/S0142716404001298.
- Jiang, N. (2018). *Second language processing – an introduction*. New York, U.S.A. & Oxfordshire, U.K.: Routledge.
- Johnson, J.S., Shenkman, K.D., Newport, E.L. & Medin, D. (1996). Indeterminacy in the grammar of adult language learners. *Journal of Memory and Language*, 35, 335-352.
- Johnson, K. (1997). Speech perception without speaker normalisation. In Johnson, K. & Mullennix, J.W. (eds.), *Talker variability in speech processing*, pp 145 – 165. San Diego, U.S.A: Academic Press.
- Johnson-Laird, P. N. (1980). Mental models in cognitive science. *Cognitive Science*, 4(1), 71-115.
- Johnson-Laird, P. N. (1983). *Mental models*. Cambridge: Cambridge University Press.

- Kennedy, S. & Blanchet, J. (2014). Language awareness and perception of connected speech in a second language. *Language Awareness* (23:1-2), pp 92-106. doi: 10.1080/09658416.2013.863904.
- Keuleers, E. & Brysbaert, M. (2010). _Wuggy: A multilingual pseudoword generator. *Behavior Research Methods*, 42(3), 627-633. doi:10.3758/BRM.42.3.627.
- Kök, I. (2017). Relationship between listening comprehension strategy use and listening comprehension proficiency. *International Journal of Listening*, 32(3), 163-179. doi:10.1080/10904018.2016.1276457.
- Koornneef, A. & Reuland, E. (2016). On the shallow processing (dis)advantage: grammar and economy. *Frontiers in Psychology*, 10 February 2016. Retrieved online from: <https://doi.org/10.3389/fpsyg.2016.00082>
- Krashen, S. (1981). *Second language acquisition and second language learning*. Oxford: Pergamon.
- Krashen, S. (1993). The effect of grammar teaching: still peripheral. *TESOL Quarterly* 27, 717-725.
- Langacker, R.W. (1987). *Foundations of cognitive grammar: Theoretical prerequisites* (Vol. 1). Stanford, C.A., U.S.A.: Stanford University Press.
- Langacker, R.W. (2008). *Cognitive Grammar: A basic introduction*. Oxford, U.K. & New York, U.S.A.: Oxford University Press.
- Larsen-Freeman, D. (2010). Not so fast: a discussion of L2 morpheme processing and acquisition. *Language Learning*, 60(1), March 2010, 221–230.

Larsen-Freeman, D. (2015). Thinking allowed. *Language Teaching* (48)2, 263-280.

Lee, Shinsook. (2016). Native and non-native listeners' sensitivity to English onset restrictions and universal onset markedness. *Poznan Studies in Contemporary Linguistics*, 52(4). Published online 16 November 2016.
doi: <https://doi-org.ezproxy.sussex.ac.uk/10.1515/psicl-2016-0027>.

Leminen, A., Leminen, M., Lehtonen, M., Nevalainen, P., Ylinen, S., Kimppa, L., Sannemann, C., Makela, J.P. & Kujala, T. (2011). Spatiotemporal dynamics of the processing of spoken inflected and derived words: a combined EEG and MEG study. *Frontiers in Human Neuroscience*, 5(66). Published online Jul 21 2011.
doi:10.3389/fnhum.2011.00066.

Leminen, A., Lehtonen, M., Leminen, M., Nevalainen, P., Makela, J.P., & Kujala, Y. (2013a). The role of attention in processing morphologically complex spoken words: an EEG/MEG Study. *Frontiers in Human Neuroscience*, 6. Published online 9 Jan. 2013. Doi: 10.3389/fnhum.2012.00353.

Leminen, A., Leminen, M., Kujala, T., Shtyrov, Y. (2013b). Neural dynamics of inflectional and derivational morphology processing in the human brain. *Cortex*, 49(10), 2758-71. Published online 27 Aug. 2013. doi: 10.1016/j.cortex.2013.08.007.

Levelt, J.M. (1999). Models of word production. *Trends in Cognitive Sciences* (3)6, 223-232.

Liu, N.F. (2002). *Processing Problems in L2 Listening Comprehension of University Students in Hong Kong*. Hong Kong: PhD thesis held in Pao Yue-Kong library, Hong Kong Polytechnic University. Retrieved online from <http://hdl.handle.net/10397/2718>.

- Lynch, T. (2011). Academic listening in the 21st century: Reviewing a decade of research. *Journal of English for Academic Purposes*, 10(2), 79–88.
- MacWhinney, B. (1987). Applying the competition model to bilingualism. *Applied Psycholinguistics* (8), 315-327.
- MacWhinney, B. (ed.) (1999). *The emergence of language*. Mahwah, N.J., U.S.A: Lawrence Erlbaum.
- Mahmoud, A. (2013). An investigation of listening comprehension problems encountered by Saudi students in the EL classroom. *International Journal of Academic Research in Progressive Education and Development*, 2(2), 113 – 155.
- Marantz, A. (2013). No escape from morphemes in morphological processing. *Language and Cognitive Processes*, 28(7), 905-916. DOI: 10.1080/01690965.2013.779385.
- Marian, V. and Spivey, M. (2003). Competing activation in bilingual language processing: within- and between-language competition. *Bilingualism: Language and Cognition*, 6, 97-115.
- Marslen-Wilson, W. (1975). Sentence perception as an interactive parallel process. *Science*, 89(4198), 226-228.
- Mattys, S.L. & Wiget, L. (2011). Effects of cognitive load on speech recognition. *Journal of Memory and Language*, 65(2), 145 – 160. Retrieved online from <https://doi.org/10.1016/j.jml.2011.04.004>.

- McClelland, J.L., Rumelhart, D.E. & Hinton, G.E. (1986). The appeal of Parallel Distributed Processing. In Rumelhart, D.E., McClelland, J.L. & the PDP Research Group, *Parallel Distributed Processing, (1)*, pp 3-44). Cambridge, M.A., U.S.A: M.I.T. Press.
- McDonough, J., Shaw, C. & Masuhara, H. (2013). *Materials and Methods in ELT*, 3rd Edition. West Sussex: Wiley-Blackwell.
- McLaughlin, B. (1987). *Theories of Second Language Learning*. London: Arnold.
- Morgan-Short, K., Sanz, C., Steinhauer, K. & Ullman, M.T. (2010). Second language acquisition of gender agreement in explicit and implicit training conditions: an event-related potential study. *Language Learning* 60(1), 154–193.
- Morgan-Short, K., Steinhauer, K., Sanz, C. & Ullman, M.T. (2012). Explicit and implicit second language training differentially affect the achievement of native-like brain activation patterns. *Journal of Cognitive Neuroscience*, 24(4), 933-947.
- Newman, A.J., Ullman, M.T., Pancheva, R., Waligura, D.L. & Neville, H.J. (2007). An ERP study of regular and irregular English past tense inflection. *NeuroImage*, 34(1), 435–445.
- Nord, J. (1980). Developing listening fluency before speaking; an alternative paradigm. *System*, 8, 1-22.
- Nord, J. (1998). *Condemning our students to mediocrity* Publication of James R Nord, Online @ www.geocities.ws/jr_nord/index-2.html.

- Nunan, D. (1999). *Second Language Teaching and Learning*. Boston, U.S.A: Heinle and Heinle.
- Oakhill, J., Garnham, A. & Vonk, W. (1989). The on-line construction of discourse models. *Language and Cognitive Processes*, 4(3-4), S1263-S1286. Published online: 13 Dec. 2007. Retrieved from <https://doi.org/10.1080/01690968908406370>.
- Ozubko, J.D. & Joordens, S. (2011). The Similarities (and Familiarities) of Pseudowords and Extremely High-Frequency Words: Examining a Familiarity-Based Explanation of the Pseudoword Effect. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 37(1), 123-139. doi: 10.1037/a0021099.
- Palmer, F.R. (2001). *Mood and modality*, 2nd edition. Cambridge, UK: Cambridge University Press.
- Paradis, M. (2004). *A neurolinguistics theory of bilingualism*. Amsterdam, NL: Benjamins.
- Pinker, S. (1991). Rules of language. *Science*, 253, 530-535.
- Pinker, S. (1999). *Words and rules: the ingredients of language*. New York, NY: Basic Books Inc.
- Pinker, S. & Ullman, M.T. (2002). The past and future of the past tense. *Trends in Cognitive Sciences*, 6, 456 – 463.
- Pulvermüller, F. (2001). Brain reflections of words and their meaning. *Trends in Cognitive Sciences*, 5(12), 517–524.

- Pulvermüller, F., Cook, C. & Hauk, O. (2012). Inflection in action: semantic motor system activation to noun- and verb-containing phrases is modulated by the presence of overt grammatical markers. *NeuroImage*, 60(2), 1367–1379. doi: 10.1016/j.neuroimage.2011.12.020.
- Radford, A., Atkinson, M., Britain, D., Clahsen, H., & Spencer, A. (2009). *Linguistics – an introduction*, 2nd edition. Cambridge, UK: Cambridge University Press.
- Renandya, W.A. & Farrell, T.S.C. (2011). ‘Teacher, the tape is too fast!’ Extensive listening in ELT. *English Language Teaching Journal*, 65 (1), 52 – 59.
- Reynolds, B.L. (2015). The effects of nonce words, frequency, contextual richness, and L2 vocabulary knowledge on the incidental acquisition of vocabulary through reading: more than a replication of Zahar et al. (2001) & Tekmen and Daloğlu (2006). *International Review of Applied Linguistics in Language Teaching*. doi: <https://doi.org/10.1515/iral-2015-0115>.
- Ridgeway, T. (2000). Listening strategies—I beg your pardon. *ELT Journal*, 54(2), 179–85.
- Rohde, D.L.T. & Plaut, D.C. (2003). Connectionist models of language processing. *Cognitive Studies*, 10(1), 10-28.
- Rost, M. (1994). *Introducing Listening*. Harmondsworth: Penguin.
- Rost, M. (2005). L2 Listening. In E. Hinkel (Ed.), *Handbook of Research in Second Language Teaching and Learning*, (pp 503-528). Mahwah, NJ: Lawrence Erlbaum Associates Inc.

- Rost, M. (2014). Listening in a multilingual world: the challenges of second language (L2) listening. *International Journal of Listening*, 28(3), 131-148.
- Roussel, S., Gruson, B. & Galan, J.P. (2017). What types of training improve learners' performances in second language listening comprehension? *International Journal of Listening*. Routledge. Published online: 14 June 2017.
doi: 10.1080/10904018.2017.1331133.
- Rüschemeyer, S., Nojack, A. and Limbach, M. (2008). A mouse with a roof? Effects of phonological neighbours on processing of words in sentences in a non-native language. *Brain and Language*, 104, 113-121.
- Saville-Troike, M. & Barto, K. (2017). *Introducing Second Language Acquisition*, 3rd edition. Cambridge, UK: Cambridge University Press.
- Scheffler, P. (2012). Theories pass. Learners and teachers remain. *Applied Linguistics*, 33(5), 603-607.
- Schmid, H.J. (2014). *A Framework for understanding linguistic entrenchment and its psychological foundations in memory and automatization*. Retrieved online at http://www.anglistik.uni-muenchen.de/personen/professoren/schmid_publ/entrenchment-intro.pdf [date accessed: October 2019].
- Schmidt, R. (1990). The role of consciousness in second language learning. *Applied Linguistics*, 11, pp 129-158.

- Schmidt, R. (2010). Attention, awareness, and individual differences in language learning. In Chan, W.M., Chi, S., Cin, K.N., Istanto, J., Nagami, M., Sew, J.W., Suthiwan, T. & Walker, I., *Proceedings of CLaSIC 2010, Singapore, December 2-4* (pp. 721-737). Singapore: National University of Singapore, Centre for Language Studies.
- Schreuder, R. & Baayen, R.H. (1995). Modeling morphological processing. In L. B. Feldman (Ed.), *Morphological aspects of language processing*. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Inc.
- Segalowitz, N. (2003). Automaticity and Second Languages. In C. Doughty, & M. H. Long (Eds.), *The Handbook of Second Language Acquisition*, (pp. 382-408). Malden, MA: Blackwell.
- Seidenberg, M.S. & Plaut, D.C. (2014). Quasiregularity and its discontents: the legacy of the past tense debate. *Cognitive Science*, 38, 1190-1228. Retrieved online at <https://doi-org.ezproxy.sussex.ac.uk/10.1111/cogs.12147>.
- Selinker, L. (1972). Interlanguage. *IRAL*, 10(2), 209-231.
- Shafer, V.L., Kessler, K.L., Schwartz, R.G., Morr, M.L. & Kurtzberg, D. (2005). Electrophysiological indices of brain activity to “the” in discourse. *Brain and Language*, 93, 277–297. Available online from December 2004. doi:10.1016/j.bandl.2004.10.008.
- Shang, H.F. (2005). An Investigation of Cognitive Operations on L2 Listening Comprehension Performance: An Exploratory Study. *International Journal of Listening*, 19(1), 51-62.

- Shanks, D.R. (1995). *The psychology of associative learning*. New York, U.S.A. & Cambridge, U.K: Cambridge University Press.
- Sheerin, S. (1987). Listening comprehension: teaching or testing. *ELT Journal*, 41(2), 126–31.
- Spada, N. & Tomita, Y. (2010). Interactions between type of instruction and type of language features. *Language Learning*, 60(2), 1-46.
- Szmaliec, A., Brysbaert, M. & Duyck, W. (2013). Working memory and (second) language processing. In J. Altarriba & L. Isurin (Eds.), *Memory, Language and Bilingualism: theoretical and applied approaches*, (pp74-94). Cambridge: Cambridge University Press. doi:10.1017/CBO9781139035379.004.
- Taft, M. & Forster, K.I. (1975). Lexical storage and retrieval of prefixed words. *Journal of Verbal Learning and Verbal Behaviour*, 14, 638 – 647.
- The Five Graces Group: Beckner, C., Blythe, R., Bybee, J., Christiansen, M.H., Croft, W., Ellis, N., Holland, J., Ke, J., Larsen-Freman, D. & Schoenemann, T. (2009). Language is a complex adaptive system: a position paper. *Language Learning*, 59, Supplement 1, 1 -26.
- Tomasello, M. (1998). Introduction: a cognitive-functional perspective on language structure, pp vii-xxiii. Mahwah, N.J., U.S.A: Lawrence Erlbaum.
- Tomasello, M. (2003). *Constructing a language: a usage-based theory of language acquisition*. Cambridge, M.A., U.S.A: Harvard University Press.

- Tomasello, M. (2009). The usage-based theory of language acquisition. In Bavin, E.L. (ed.), *The Cambridge Handbook of child language*, chapter 5, pp 69 – 70. Published online (2012): online ISBN: 9780511576164.
- Trenkic, D. (2007). Variability in second language article production: beyond the representational deficit vs processing constraints debate. *Second Language Research*, 23(3), 289-327.
- Trenkic, D., Mirkovic, J., & Altmann, G.T.M. (2014). Real-time grammar Processing by native and non-native speakers: Constructions unique to the second Language. *Bilingualism: Language and Cognition*, 17(2), 237-257.
doi:10.1017/S1366728913000321.
- Ullman, M.T. (2001). A neurocognitive perspective on language: the declarative/procedural model. *Nature Reviews Neuroscience* , 2(10), 717-726.
doi: 10.1038/35094573.
- Ullman, M.T. (2004). Contributions of memory circuits to language: the declarative/procedural model. *Cognition*, 92(1-2), May-June 2004, 231-270.
<https://doi.org/10.1016/j.cognition.2003.10.008>.
- Ullman, M. T. (2005). A cognitive neuroscience perspective on second language acquisition: The declarative/procedural model. In Sanz, C. (Ed.), *Mind and context in adult second language acquisition* (pp. 141–178). Washington, DC: Georgetown University Press.
- Underhill, A. (1994). *Sound Foundations: living phonology*. Oxford: Heinemann.

- Vandergrift, L. (2007). Recent developments in second and foreign language listening comprehension research. *Language Teaching*, 40(3), 191–210.
- VanPatten, B. (1990). Attending to Form and Content in the Input: An Experiment in Consciousness. *Studies in Second Language Acquisition*, 12(3), 287-301.
(Published online by Cambridge University Press: 07 November 2008).
doi:10.1017/S0272263100009177.
- Warren, P. (2013). *Introducing Psycholinguistics* Cambridge, UK: Cambridge University Press.
- Warren, R.M., & Warren, R.P. (1970). Auditory Illusions and Confusions. *Scientific American*, 223, 30-36.
- Weber, A. & Broersma, M. (2012). Spoken word recognition in second language acquisition. In Chapelle, C.A. (ed.), *The Encyclopedia of Applied Linguistics*. Bognor Regis, UK: Wiley-Blackwell. Retrieved online at Doi: 10.1002/9781405198431.
- Weber, A. & Crocker, M.W. (2012). On the Nature of Semantic Constraints on Lexical Access. *Journal of Psycholinguistics Research*, 41, 195-214.
- Weber, A. and Cutler, A. (2004). Lexical competition in non-native spoken-word recognition. *Journal of Memory and Language*, 50, 1-25.
- Weber, A., & Scharenborg, O. (2012). Models of spoken-word recognition. *Cognitive science*, 02 April 2012. Retrieved online at doi: 10.1002/wcs.1178.
- Wilson, M. (2003). Discovery listening – improving perceptual processing. *ELT Journal* 57 (4), 335-343, October 2003.

Yule, G. (2010). *The study of language*, 4th edition. Cambridge, UK: Cambridge University Press.

Zhang, X. & Mai, C. (2018). Effects of entrenchment and pre-emption in second language learners' acceptance of English denominal verbs. *Applied Psycholinguistics*, 39, 413-436. Doi: 10.1017/S0142716417000406.

Appendices

Appendix 1 – Studies 1 – 5 test materials

Appendix 1a. Study 1 – inflected past tense verb endings

Study 1 - short sentences

Items

1. They call us with their new phones	Present
2. We organised our study group	Past -d
3. They wanted more English lessons	Past -id
4. We played football with our friends	Past -d
5. They asked us about the reports	Past -t
6. We play some of the games with them	Present
7. I enjoy interesting films	Present
8. I studied English at college	Past -d
9. They liked old history books	Past -t
10. They visited more museums	Past -id
11. We helped our parents with housework	Past -t
12. They agree with you completely	Present
13. We decided on a topic	Past -id
14. You prefer a cup of tea	Present
15. We paid for all of the cakes	Past -d
16. They hated football very much	Past -id

17. We cleaned our house before school	Past -d
18. We look at our emails quickly	Present
19. They joined a new sports centre	Past -d
20. We learnt a lot from the teacher	Past -t
21. I collected my marked essay	Past -id
22. You walked very fast to the class	Past -t
23. I borrow many books from him	Present
24. I kicked hard at the football	Past -t
25. They try only the new things	Present
26. You attended all the classes	Past -id
27. They talk about their party	Present
28. They stayed at home almost all day	Past -d
29. <i>You explained some problems to him</i>	Past -d
30. You fetch your laptop computer	Present
31. I worked hard before my exams	Past -t
32. They invited him to their house	Past -id
33. I turn on the large TV	Present
34. We borrowed five books from him	Past -d
35. I suggested a new plan	Past -id
36. You plan your essay carefully	Present
37. We enjoyed all our lessons	Past -d
38. I cooked a meal for my friends	Past -t
39. They waited for almost one hour	Past -id
40. They research Art History	Present
41. We switched on the computers	Past -t
42. They examine some evidence	Present
43. They asked us about the exam	Past -t
44. We recorded our progress	Past -id
45. They inform us about it	Present

Study 1 – longer sentences

Items

46. Fortunately, you focus well in the very difficult exam	Present
47. After my accident, I worked more slowly on my research project	Past -t
48. In the evenings, we talked about many different and interesting things	Past -t
49. Fortunately, we attended our classes in the afternoons each day	Past -id
50. Nearly every day, we emailed our old friends at home after our lectures	Past -d
51. Unfortunately, our lessons start at 8 o'clock in the morning	Present
52. At university, lecturers provided support for the students	Past -id
53. <i>In the bank, they informed students how to register for an account</i>	Present
54. <i>Additionally, they managed their work efficiently and professionally</i>	Past -d
55. In the meantime, they listen with interest to the teacher's explanation	Present
56. During football practice, the boys kicked footballs into the goals on both sides	Past -t

57. On the contrary, I liked your beautiful and colourful new hat	Past –t
58. In July each year, students graduated at the end of their courses	Past –id
59. In the IT department, I printed my essays before submission	Past –id
60. For my mother's birthday, I book some theatre tickets for a show	Present
61. In hospital, they examine a person carefully after a crash	Present
62. Fortunately, we walked from home to school in less than twenty minutes	Past –t
63. In the museum, they showed all the visitors the new pieces of art	Past –d
64. In our history classes, we looked into both old and new traditions	Past –t
65. Unfortunately, you preferred your sister's essay to your own essay	Past –d
66. Happily, we dance for the whole night at their wonderful marriage party	Present
67. In the afternoon, we climb all the tall apple trees in our friends' large garden	Present
68. Often at conferences, new presenters sounded less confident at first	Past –id
69. In our classes, three people from our team presented our work every week	Past –id
70. In our research, we observed economic and political systems	Past –d
71. Happily, we watched all the old black and white films from the nineteen forties	Past –t
72. Additionally, I called my brother and my sister every day	Past –d
73. On the contrary, I study much better with my music on than off	Present
74. More often, newspapers reported talk about people than news on wars	Past –id
75. In the lesson, they explain about the introduction of the project	Present
76. In my kitchen, I cooked some really wonderful and delicious food	Past –t
77. With my supervisor, I considered good research for future projects	Past –d
78. Overall they like the experience of a long walk up the mountain	Present
79. Excitedly, we played for hours with our newest and best computer game	Past –d
80. After the exams, the students relax for as long as possible	Present
81. In addition, we helped him successfully with his essay project	Past –t
82. In the exam periods, I studied from early morning until late	Past –d
83. Before our holiday, our parents reserve one hotel room per person	Present
84. For several days, we waited excitedly for our new car, a Porsche	Past –id
85. After hard training, football players rested as long as possible	Past –id
86. Quite often they needed a lot of help from their teachers with their essays	Past –id
87. Fortunately for our team, we decide most things easily together	Present
88. During my classes, I learnt everything about problems and solutions	Past –t
89. During the classes, I answered at least three of the questions each time	Past –d
90. Interestingly, you work faster than me with music in the background	Present

N.B. The items in italics, no. 29 in the short sentences and nos. 53 and 54 in the long sentences were the three items that were excluded from the results.

Appendix 1b. Study 2 – reduced auxiliary verb cliticsStudy 2 - short sentences**Items**

1. I arranged a meeting with them	No
2. You've walked fast to the train station	Yes P
3. I turned off the classroom light	No
4. I've finished all my homework	Yes P
5. We should've arrived there early	Yes M
6. They've agreed to meet him in class	Yes P
7. You could've joined the other group	Yes M
8. We could call them before breakfast	No
9. They would've helped their friend	Yes M
10. I might've talked to him by then	Yes M
11. You should've studied that book	Yes M
12. We listened to this song often	No
13. You could phone them at any time	No
14. I would've considered the trip	Yes M
15. I've signed up for my extra course	Yes P
16. You've played the piano well	Yes P
17. We've enjoyed the trip to London	Yes P
18. You could wash the new car better	No
19. We may've watched the sports on TV	Yes M
20. He'd wanted to go with them	No
21. They may've worked there for 3 years	Yes M
22. We've tried hard to succeed	Yes P
23. They prefer tea to coffee	No
24. They've asked about the problem	Yes P
25. They've travelled to the airport	Yes P
26. You could've borrowed two more books	Yes M
27. You organised your work well	No
28. They might've listened to him well	Yes M
29. They might switch the computer off	No
30. We've emailed our professor	Yes P

Study 2 - short sentences**Items**

31. I was sure that he would've asked them for some help with his project	Yes M
32. Your teacher should know that you've worked on your essay for more than four weeks	Yes P
33. We would tell them that they should walk to the other classroom for the class	No
34. The professor said that the students could've studied that text much better	Yes M

35. The musician played the music that the children listened to very much	No
36. The children said that they may've switched the computers on in the classroom	Yes M
37. We wanted to ask them how they could finish their work so very quickly	No
38. They asked us how much we've enjoyed the new film in the cinema	Yes P
39. Their friend asked them if they've paid for their new computer by credit card	Yes P
40. There was a lot of work to do; however, they would've finished by six.	Yes M
41. They like coffee; however, they stopped coffee breaks in the afternoon	No
42. The students should tell their teacher that they've discovered a new museum	Yes P
43. We love singing so much that we've joined a professional music group	Yes P
44. We like chocolate a lot; however, we've tried to stop eating so much	Yes P
45. My friends said that they should've encouraged the new girl to study with them	Yes M
46. The father said that the boy would stay there in the house with his sister	No
47. The teacher explained quickly how the students should've organised their work	Yes M
48. The man told us that he could play tennis as his professional job	No
49. The children said that they may've turned the lights off in all the rooms at home	Yes M
50. The football manager was certain that the player could've played better	Yes M
51. The students thought that the professor would explain the project again	No
52. The woman in the shop said she might've ordered the new computers soon	Yes M
53. My friend told her teacher that I've helped her with the English homework	Yes P
54. My friends told us that they've watched television every evening	Yes P
55. My brother asked me if he should stay there in the hospital longer	No
56. The teacher wants to know if you've looked at all the books on the reading list	Yes P
57. The professor asked me how I've discovered so much new information	Yes P
58. He thought that I could try the new Italian restaurant without him	No
59. The cleaner said that she might've cleaned this room before the afternoon class	Yes M
60. The students believed that they worked as much as possible on their essays	No

Appendix 1c. Study 3 – derivational morpheme suffixes

Examples given to participants

i. happy _____

You hear: "We talked happily about the film on TV that we had seen the evening before."

You should write: happy ly

(The spelling is not important. However, if you prefer to spell the word correctly, you can write:
happy happily)

ii. reflect _____

You hear: "After talking to the Professor, they worked hard and reflectively on their final research projects."

You should write: reflect ively

(The spelling is not important. However, if you prefer to spell the word in full, you can write:
reflect reflectively)

iii. impress _____

You hear: "We thought it was a very impressive report because it included so many details."

You should write: impress ive (or impress: impressive)

iv. interest _____

You hear: Their English was good but, interestingly, they started learning English as adults."

You should write: interest ingly (or interest interestingly)

Items

1. suggest _____

His made some suggestive comments about the way he wanted us to complete the projects.
-ive

2. investigate _____

I was surprised that my friend had chosen investigative journalism as his profession.
-ive

3. collaborate _____

I would be happy to help you, she said collaboratively to the others in her team.
-ively

4. investigate _____

The police wanted us to know that their investigation of the crime was progressing well.
-ion

5. act _____

The student informed the teacher that he was actively reading all the books on the reading list.
-ively

6. express _____

We thought that the picture he painted was expressive of his feelings and included many details.
-ive

7. motivate _____

The Professor's good and highly motivational lecture resulted in the students developing their research ideas.
-ional

8. beauty _____

The actress was famous for her many films and for singing beautifully to the President at his birthday party.
-fully

9. worry _____

Because of the extra people at the party, she said worriedly to her friend that there was not enough food for everyone.
-edly

10. excite _____

His team won the football match, and he excitedly told everyone in his family how he scored the final goal.
-edly

11. include _____

It was necessary to have an inclusive group so that everyone felt they were an important member of the group.

-sive (ending change)

12. collaborate _____

She understood that his style of collaboration was probably going to cause some confusion.

-ion

13. surprise _____

She understood everything very quickly because he explained surprisingly clearly what they needed to do for the project.

-ingly

14. terrify _____

Because of the snow on the road, the accident happened terrifyingly quickly and he couldn't do anything to stop it.

-ingly

15. realise _____

It wasn't long before he had the realisation that he couldn't understand anything.

-ation

16. except _____

He studied very hard before the exam and was able to write exceptionally well on each of the subjects.

-ionally

17. except _____

The artist painted every day with the exception of Christmas Day and his own birthday.

-ion

18. excel _____

All kinds of organisations, including universities, try to achieve excellence in the way that they work.

-ence

19. except _____

The actress was given an Oscar award for her exceptional performance in the film

-ional

20. fantastic _____

All her life she had had a fantasy about becoming an astronaut and travelling to other planets.

-y (ending change)

21. satisfy _____

He told me that he achieved satisfaction through working as hard as he could work.

-action (ending change)

22. intelligent _____

During the interview, the student intelligently answered all the questions and was offered a place on the Master's degree course.

-ly

23. excel _____

All university professors want the most hard-working and excellent students on their courses.

-ent

24. joy _____

His teacher told him that he had received a really good mark and he phoned his parents joyfully to tell them the good news.

-fully

25. manage _____

Difficult decisions are made by the management of large businesses on a daily basis.
-ment

26. excel _____

You must perform your sport excellently if you want to win a medal in the Olympic Games.
-ently

27. satisfy _____

He worked hard and made satisfactory progress so he finished the project in a short time.
-actory (ending change)

28. communicate _____

Luckily, all the team included only communicative members and so there were no problems for each of them to know what to do.
-ive

29. complicate _____

He wanted to know who he should ask if he had a complication with his research project.
-ion

30. consider _____

The researcher said that he must give a lot of consideration to all the questions before he could find the best answer.
-ation

31. lazy _____

The room was very dirty but she cleaned lazily and so it was still dirty even after she had finished.
-ly

32. convenience _____

He wasn't able to attend the lecture, but his girlfriend conveniently took a lot of notes for him.
-ently

33. culture _____

When you travel in another country, things can be very different culturally from your home country.

-ally

34. engage _____

My fiancé and I had a long engagement before we finally got married last year.

-ment

35. satisfy _____

We hoped that we had satisfactorily completed the questionnaire for our visa application.

-actorily

36. educate _____

The university's leaders and managers wanted to be sure that educational standards were as high as possible.

-ional

37. arrange _____

We paid a lot of money for the flowers and hoped that the flower arrangement would be really fantastic.

-ment

38. institute _____

When I started my new job, I was given the institutional hand book full of Information for new employees.

-ional

39. organise _____

The manager hired a new secretary, who was organisationally the best secretary he'd ever had.

-ationally

40. protect _____

The mother always talked protectively about her child even when he started fights with other children.

-ively

41. problem _____

It seemed that it was a difficult and problematic situation, even more so than we had expected it would be.

-atic

42. communicate _____

They told us that it was a secret and it was not a communicable secret so we should not tell anyone about it.

-able

43. continue _____

I thought the best way forward was the continuation of my study plans which had already been working well.

-ation

44. real _____

We discussed all the solutions but decided realistically we needed more time to find the right solution.

-istically

45. continue _____

In every conversation we had, he interrupted continually which was not very polite.

-ally

46. real _____

The picture I had was not painted by the original artist but it was a very realistic copy by a talented young painter.

-istic

47. attend _____

The Professor's lectures were so interesting that attendance amongst the students was Always one hundred per cent.

-ance

48. amaze _____

The runner practised a lot before the competition and ran so amazingly that he won three of the four races.

-ingly

49. consider _____

He wanted us to do a considerable amount of work for very little pay, so we said no.

-able

50. ally _____


He wanted to know whether our alliance was with him or with his enemies.

-ance

The sheet below was given to the participants after they had finished the test in Study 3. The aim was to check whether the words in Part 3 were high or low frequency ones for the participants.

Instructions to participants:

Do you know these words? Please complete the table.

Word	I know this word well	I know this word but don't use it or see it often	I don't know the word but I can understand what it means	I don't know the word and I don't understand it
however				
suggestive				
investigative				
collaboratively				
investigation				
actively				
expressive				
motivational				

beautifully				
worriedly				
excitedly				
inclusive				
surprisingly				
terrifyingly				
collaboration				
realisation				
exceptionally				
exception				
excellence				
exceptional				
fantasy				
satisfaction				
intelligently				
excellent				
joyfully				
management				
excellently				
satisfactory				
communicative				
complication				
consideration				
lazily				
conveniently				
culturally				
engagement				
satisfactorily				
educational				
arrangement				
institutional				
organisationally				
protectively				
problematic				
communicable				
continuation				
realistically				
continually				
realistic				
attendance				
amazingly				
considerable				
alliance				

Appendix 1d. Study 4 – inflected morpheme endings

Study 4 - Section 1: past tense -ed inflections, using vuff, vuvv, keff, kevv as regular non-word verbs

Sentences

I quite often vuvv only one before class.	X	4
I quite often vuvved only one before class.	X	6
I quite often vuff only one before class.	X	4
I quite often vuffed only one before class.	X	6
The boys sometimes kevv another one.	X	4
The boys sometimes kevvved another one.	X	6
The boys sometimes keff another one.	X	4
The boys sometimes keffed another one.	X	6

Items

1. I quite often vuff only one before class.
2. The boys sometimes kevvved another one.
3. I quite often vuvv only one before class.
4. The boys sometimes keffed another one.
5. The boys sometimes kevvved another one.
6. I quite often vuvved only one before class.
7. The boys sometimes kevv another one.
8. The boys sometimes keff another one.
9. I quite often vuff only one before class.
10. The boys sometimes kevv another one.
11. I quite often vuffed only one before class.
12. I quite often vuvved only one before class.
13. I quite often vuvved only one before class.
14. The boys sometimes keffed another one.
15. The boys sometimes kevvved another one.
16. I quite often vuvv only one before class.
17. The boys sometimes keffed another one.
18. I quite often vuffed only one before class.
19. The boys sometimes keff another one.
20. The boys sometimes keff another one.
21. I quite often vuffed only one before class.
22. I quite often vuvv only one before class.
23. The boys sometimes kevvved another one.
24. I quite often vuff only one before class.
25. I quite often vuffed only one before class.
26. I quite often vuvved only one before class.
27. The boys sometimes kevv another one.
28. The boys sometimes keff another one.

29. The boys sometimes keffed another one.
30. I quite often vuvved only one before class.
31. I quite often vuffed only one before class.
32. The boys sometimes kevv another one.
33. I quite often vuffed only one before class.
34. The boys sometimes kevvved another one.
35. The boys sometimes keffed another one.
36. I quite often vuvv only one before class.
37. The boys sometimes kevvved another one.
38. The boys sometimes keffed another one.
39. I quite often vuff only one before class.
40. I quite often vuvved only one before class.

Study 4 - Section 2: plural -s inflections, using lot and lod as regular nouns

Sentences

I have the funny lot in my room.	X	4
I have the funny lots in my room.	X	6
I have the funny lod in my room.	X	4
I have the funny lods in my room.	X	6

Items

1. I have the funny lot in my room.
2. I have the funny lods in my room.
3. I have the funny lods in my room.
4. I have the funny lots in my room.
5. I have the funny lod in my room.
6. I have the funny lod in my room.
7. I have the funny lots in my room.
8. I have the funny lot in my room.
9. I have the funny lots in my room.
10. I have the funny lods in my room.
11. I have the funny lods in my room.
12. I have the funny lots in my room.
13. I have the funny lods in my room.
14. I have the funny lot in my room.
15. I have the funny lod in my room.
16. I have the funny lots in my room.
17. I have the funny lots in my room.
18. I have the funny lods in my room.
19. I have the funny lot in my room.
20. I have the funny lod in my room.

Study 4 - Section 3: plural -s inflections, /s/ or /z/**Sentences**

I heard about the place over there.	X	5
I heard about the plays over there.	X	5
She thought about the rice over there.	X	5
She thought about the rise over there.	X	5

Items

1. She thought about the rice over there.
2. I heard about the plays over there.
3. I heard about the place over there.
4. She thought about the rise over there.
5. I heard about the plays over there.
6. She thought about the rise over there.
7. She thought about the rice over there.
8. I heard about the place over there.
9. I heard about the plays over there.
10. She thought about the rice over there.
11. She thought about the rise over there.
12. I heard about the place over there.
13. She thought about the rise over there.
14. I heard about the plays over there.
15. She thought about the rice over there.
16. I heard about the place over there.
17. She thought about the rise over there.
18. I heard about the plays over there.
19. She thought about the rice over there.
20. I heard about the place over there.

Appendix 1e. Study 5 – reduced auxiliary and modal verb cliticsStudy 5 – Section 1: have reduced to 've**Sentences**

I think they put the lights on	X	8
I think they've put the lights on	X	12
I hope we left the keys here	X	8
I hope we've left the keys here	X	12

Items

1. I hope we've left the keys here
2. I think they put the lights on
3. I think they've put the lights on
4. I hope we've left the keys here
5. I hope we've left the keys here
6. I think they've put the lights on
7. I think they've put the lights on
8. I hope we left the keys here
9. I hope we left the keys here
10. I hope we've left the keys here
11. I think they put the lights on
12. I hope we've left the keys here
13. I think they've put the lights on
14. I hope we've left the keys here
15. I think they put the lights on
16. I think they put the lights on
17. I think they've put the lights on
18. I hope we've left the keys here
19. I hope we've left the keys here
20. I think they put the lights on
21. I hope we left the keys here
22. I think they put the lights on
23. I hope we've left the keys here
24. I hope we left the keys here
25. I think they've put the lights on
26. I hope we've left the keys here
27. I hope we've left the keys here
28. I hope we've left the keys here
29. I think they put the lights on
30. I hope we left the keys here
31. I think they've put the lights on
32. I think they've put the lights on
33. I think they've put the lights on
34. I hope we left the keys here
35. I hope we left the keys here
36. I think they've put the lights on
37. I hope we left the keys here
38. I think they've put the lights on
39. I think they put the lights on
40. I think they've put the lights on

Study 5 – Section 2: would and had reduced to 'd**Sentences**

Of course we only want one	X	10
Of course we'd only want one	X	10
I thought I answered all the questions.	X	4
I thought I'd answered all the questions.	X	6
Of course they like tea.	X	4
Of course they'd like tea.	X	6

Items

1. Of course we only want one
2. Of course we only want one
3. Of course we'd only want one
4. Of course we only want one
5. Of course we only want one
6. Of course we'd only want one
7. Of course we'd only want one
8. Of course we only want one
9. Of course we'd only want one
10. Of course we'd only want one
11. Of course we'd only want one
12. Of course we only want one
13. Of course we only want one
14. Of course we only want one
15. Of course we'd only want one
16. Of course we'd only want one
17. Of course we only want one
18. Of course we'd only want one
19. Of course we only want one
20. Of course we'd only want one
21. I thought I'd answered all the questions.
22. Of course they'd like tea.
23. I thought I'd answered all the questions.
24. I thought I answered all the questions.
25. Of course they like tea.
26. Of course they'd like tea.
27. I thought I answered all the questions.
28. Of course they'd like tea.
29. Of course they like tea.
30. I thought I'd answered all the questions.
31. I thought I'd answered all the questions.
32. Of course they'd like tea.
33. Of course they like tea.

- 34. I thought I answered all the questions.
- 35. Of course they'd like tea.
- 36. I thought I'd answered all the questions.
- 37. I thought I answered all the questions.
- 38. Of course they'd like tea.
- 39. Of course they like tea.
- 40. I thought I'd answered all the questions.

Study 5 – Section 3: will reduced to 'll

Sentences

My mother and I'll help you	x 7
We'll do it quickly and efficiently	x 7
It seems we'll have to start again	x 7
My mother and I help you	x 6
We do it quickly and efficiently	x 6
It seems we have to start again	x 7

Items

- 1. It seems we'll have to start again
- 2. My mother and I help you
- 3. We do it quickly and efficiently
- 4. It seems we have to start again
- 5. My mother and I'll help you
- 6. We'll do it quickly and efficiently
- 7. It seems we'll have to start again
- 8. My mother and I'll help you
- 9. We'll do it quickly and efficiently
- 10. It seems we'll have to start again
- 11. We do it quickly and efficiently
- 12. It seems we have to start again
- 13. We'll do it quickly and efficiently
- 14. We do it quickly and efficiently
- 15. It seems we'll have to start again
- 16. It seems we'll have to start again
- 17. My mother and I'll help you
- 18. We'll do it quickly and efficiently
- 19. We'll do it quickly and efficiently
- 20. My mother and I help you
- 21. It seems we have to start again
- 22. We'll do it quickly and efficiently
- 23. My mother and I'll help you
- 24. My mother and I help you
- 25. It seems we have to start again

26. My mother and I help you
27. We'll do it quickly and efficiently
28. It seems we have to start again
29. It seems we have to start again
30. My mother and I'll help you
31. It seems we'll have to start again
32. We'll do it quickly and efficiently
33. It seems we have to start again
34. My mother and I help you
35. My mother and I help you
36. My mother and I'll help you
37. We do it quickly and efficiently
38. My mother and I'll help you
39. It seems we'll have to start again
40. We do it quickly and efficiently

Study 5 – Section 4: has reduced to 's

Sentences

He always put it there	x 8
He's always put it there	x 12
Of course he often left early	x 8
Of course he's often left early	x 12

Items

1. Of course he often left early
2. He always put it there.
3. Of course he's often left early
4. He's always put it there.
5. Of course he often left early
6. He's always put it there.
7. Of course he's often left early
8. He always put it there.
9. Of course he's often left early
10. Of course he often left early
11. Of course he's often left early
12. Of course he's often left early
13. He always put it there.
14. He always put it there.
15. Of course he's often left early
16. He always put it there.
17. He's always put it there.
18. He's always put it there.
19. Of course he's often left early

20. He's always put it there.
21. Of course he's often left early
22. Of course he often left early
23. Of course he often left early
24. He's always put it there.
25. He always put it there.
26. He's always put it there.
27. Of course he often left early
28. He always put it there.
29. He's always put it there.
30. He's always put it there.
31. Of course he's often left early
32. Of course he's often left early
33. Of course he's often left early
34. Of course he often left early
35. He's always put it there.
36. Of course he's often left early
37. He's always put it there.
38. Of course he often left early
39. He's always put it there.
40. He always put it there.

Study 5 – Section 5: have reduced to 've

Sentences

I think they could put the lights on	x 9
I think they could've put the lights on	x 11
We might hit the wrong button	x 8
We might've hit the wrong button	x 12

Items

1. We might've hit the wrong button
2. I think they could put the lights on
3. I think they could've put the lights on
4. We might've hit the wrong button
5. We might've hit the wrong button
6. I think they could put the lights on
7. I think they could've put the lights on
8. We might hit the wrong button
9. We might hit the wrong button
10. We might've hit the wrong button
11. I think they could put the lights on
12. We might've hit the wrong button
13. I think they could've put the lights on

14. We might've hit the wrong button
15. I think they could put the lights on
16. I think they could put the lights on
17. I think they could've put the lights on
18. We might've hit the wrong button
19. We might've hit the wrong button
20. I think they could put the lights on
21. We might hit the wrong button
22. I think they could put the lights on
23. We might've hit the wrong button
24. We might hit the wrong button
25. I think they could've put the lights on
26. We might've hit the wrong button
27. We might've hit the wrong button
28. We might've hit the wrong button
29. I think they could put the lights on
30. We might hit the wrong button
31. I think they could've put the lights on
32. I think they could've put the lights on
33. I think they could've put the lights on
34. We might hit the wrong button
35. We might hit the wrong button
36. I think they could've put the lights on
37. We might hit the wrong button
38. I think they could've put the lights on
39. I think they could put the lights on
40. I think they could've put the lights on

Study 5 – Section 6: past tense, present perfect, past perfect or modal perfect

Sentences

I think they walked there	X	10
I think they've walked there	X	10
I think they'd walked there	X	10
I think they'd 've walked there	X	10

Items

1. I think they've walked there
2. I think they'd walked there
3. I think they walked there
4. I think they'd 've walked there
5. I think they'd 've walked there
6. I think they walked there
7. I think they've walked there

8. I think they'd walked there
9. I think they've walked there
10. I think they walked there
11. I think they'd 've walked there
12. I think they'd 've walked there
13. I think they'd walked there
14. I think they'd walked there
15. I think they'd walked there
16. I think they walked there
17. I think they walked there
18. I think they'd walked there
19. I think they'd 've walked there
20. I think they've walked there
21. I think they'd 've walked there
22. I think they'd walked there
23. I think they walked there
24. I think they've walked there
25. I think they'd 've walked there
26. I think they walked there
27. I think they'd 've walked there
28. I think they'd walked there
29. I think they've walked there
30. I think they've walked there
31. I think they'd walked there
32. I think they'd 've walked there
33. I think they walked there
34. I think they walked there
35. I think they've walked there
36. I think they've walked there
37. I think they'd 've walked there
38. I think they walked there
39. I think they'd walked there
40. I think they've walked there

Study 5 – Section 5: have reduced to 've

Sentences

It's possible he might keff it quite well	x 8
It's possible he might've keffed it quite well	x 12
It's possible he could keff it quite well	x 8
It's possible he could've keffed it quite well	x 12

Items

1. It's possible he could keff it quite well

2. It's possible he might've keffed it quite well
3. It's possible he could've keffed it quite well
4. It's possible he could've keffed it quite well
5. It's possible he might keff it quite well
6. It's possible he might've keffed it quite well
7. It's possible he might've keffed it quite well
8. It's possible he could keff it quite well
9. It's possible he might keff it quite well
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11. It's possible he could've keffed it quite well
12. It's possible he could've keffed it quite well
13. It's possible he might've keffed it quite well
14. It's possible he could keff it quite well
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30. It's possible he could've keffed it quite well
31. It's possible he could keff it quite well
32. It's possible he could've keffed it quite well
33. It's possible he might keff it quite well
34. It's possible he might keff it quite well
35. It's possible he might keff it quite well
36. It's possible he could've keffed it quite well
37. It's possible he might've keffed it quite well
38. It's possible he might've keffed it quite well
39. It's possible he might've keffed it quite well
40. It's possible he could've keffed it quite well

Appendix 1f. Studies 1 – 5 – percentages of correct answers

Study 1 – short sentences

L1 group N = 38			L2-higher group (higher level) N = 25			L2-lower group (lower level) N = 40		
% correct	Freq- uency	% people	% correct	Freq- uency	% people	% correct	Freq- uency	% people
81.8	1	2.6	61.4	1	4.0	56.8	1	2.5
84.1	1	2.6	72.7	2	8.0	59.1	2	5.0
88.6	1	2.6	75.0	2	8.0	63.6	1	2.5
93.2	1	2.6	77.3	1	4.0	68.2	2	5.0
95.5	6	15.8	79.5	5	20.0	70.5	5	12.5
97.7	14	36.8	81.8	1	4.0	72.7	3	7.5
100.0	14	36.8	84.1	1	4.0	75.0	5	12.5
Total	38	100.0	86.4	3	12.0	77.3	4	10.0
			88.6	2	8.0	79.5	2	5.0
			90.9	2	8.0	81.8	1	2.5
			93.2	2	8.0	84.1	4	10.0
			95.5	2	8.0	86.4	4	10.0
			100.0	1	4.0	88.6	3	7.5
			Total	25	100.0	90.9	3	7.5
						Total	40	100.0

Study 1 – longer sentences

L1 group N = 38			L2-higher group (higher level) N = 25			L2-lower group (lower level) N = 40		
% correct	Freq- uency	% people	% correct	Freq- uency	% people	% correct	Freq- uency	% people
62.8	1	2.6	51.2	1	4.0	37.2	1	2.5
81.4	1	2.6	60.0	2	8.0	48.8	1	2.5
83.7	1	2.6	62.8	3	12.0	53.5	3	7.5
86.0	3	7.9	65.1	1	4.0	55.8	3	7.5
88.4	3	7.9	67.4	3	12.0	58.1	2	5.0
90.7	9	23.7	69.8	1	4.0	60.0	3	7.5
93.0	9	23.7	72.1	1	4.0	62.8	5	12.5
95.3	5	13.2	76.7	4	16.0	65.1	2	5.0
97.7	5	13.2	79.1	1	4.0	67.4	8	20.0
100.0	1	2.6	81.4	4	16.0	69.8	3	7.5
Total	38	100.0	83.7	2	8.0	72.1	3	7.5
			90.7	1	4.0	74.4	3	7.5
			93.0	1	4.0	79.1	1	2.5
			Total	25	100.0	83.7	2	5.0
						Total	40	100.0

Study 2 – short sentences

L1 group N = 38			L2-higher group (higher level) N = 25			L2-lower group (lower level) N = 40		
% correct	Freq- uency	% people	% correct	Freq- uency	% people	% correct	Freq- uency	% people
90.0	1	2.6	70.0	1	4.0	46.7	1	2.5
93.3	3	7.9	73.3	1	4.0	53.3	2	5.0
96.7	9	23.7	76.7	3	12.0	56.7	2	5.0
100.0	25	65.8	80.0	3	12.0	60.0	4	10.0
Total	38	100.0	83.3	5	20.0	63.3	1	2.5
			90.0	4	16.0	66.7	1	2.5
			93.3	4	16.0	70.0	2	5.0
			96.7	2	8.0	73.3	4	10.0
			100.0	2	8.0	76.7	4	10.0
			Total	25	100.0	80.0	1	2.5
						83.3	3	7.5
						86.7	4	10.0
						90.0	7	17.5
						93.3	3	7.5
						96.7	1	2.5
						Total	40	100.0

Study 2 – longer sentences

L1 group N = 38			L2-higher group (higher level) N = 25			L2-lower group (lower level) N = 40		
% correct	Freq- uency	% people	% correct	Freq- uency	% people	% correct	Freq- uency	% people
70.0	1	2.6	40.0	1	4.0	33.3	1	2.5
83.3	1	2.6	43.3	1	4.0	36.7	1	2.5
86.7	3	7.9	63.3	1	4.0	40.0	2	5.0
90.0	1	2.6	66.7	1	4.0	46.7	2	5.0
93.3	4	10.5	70.0	2	8.0	50.0	1	2.5
96.7	16	42.1	73.3	3	12.0	56.7	2	5.0
100.0	12	31.6	76.7	3	12.0	60.0	3	7.5
Total	38	100.0	80.0	2	8.0	63.3	5	12.5
			83.3	4	16.0	66.7	3	7.5
			86.7	2	8.0	70.0	6	15.0
			90.0	1	4.0	73.3	1	2.5
			93.3	2	8.0	76.7	8	20.0
			96.7	1	4.0	80.0	1	2.5
			100.0	1	4.0	83.3	2	5.0
			Total	25	100.0	86.7	1	2.5
						90.0	1	2.5
						Total	40	100.0

Study 3

L1 group N = 38			L2-higher group (higher level) N = 25			L2-lower group (lower level) N = 40		
% correct	Freq- uency	% people	% correct	Freq- uency	% people	% correct	Freq- uency	% people
90.0	1	2.6	68.0	1	4.0	58.0	1	2.5
96.0	1	2.6	72.0	1	4.0	66.0	1	2.5
98.0	12	31.6	80.0	1	4.0	68.0	3	7.5
100.0	24	63.2	82.0	2	8.0	70.0	1	2.5
Total	38	100.0	84.0	3	12.0	72.0	3	7.5
			86.0	1	4.0	74.0	3	7.5
			88.0	3	12.0	76.0	4	10.0
			90.0	4	16.0	78.0	2	5.0
			92.0	4	16.0	80.0	2	5.0
			98.0	1	4.0	82.0	6	15.0
			100.0	4	16.0	84.0	2	5.0
			Total	25	100.0	86.0	3	7.5
						88.0	2	5.0
						90.0	1	2.5
						92.0	3	7.5
						94.0	2	5.0
						98.0	1	2.5
						Total	40	100.0

Study 4. L2 listeners only. N = 24.

Section 1 – past tense -ed			Section 2 – plural -s		
% correct	Freq- uency	% people	% correct	Freq- uency	% people
42.50	1	4.0	70.00	1	4.0
45.00	1	4.0	85.00	3	12.0
50.00	3	12.0	90.00	2	8.0
52.50	1	4.0	95.00	10	40.0
57.50	1	4.0	100.00	8	32.0
65.00	1	4.0			
75.00	1	4.0			
77.50	3	12.0			
80.00	1	4.0			
82.50	2	8.0			
85.70	1	4.0			
87.50	2	8.0			
90.00	3	12.0			
92.50	1	4.0			
95.00	1	4.0			
100.00	1	4.0			

Study 5. L1: N = 40. L2: N = 23.

Study 5 – Sections 1 & 2

Section 1 – L1		Section 1 – L2		Section 2 – L1		Section 2 – L2	
% correct	Freq- uency	% correct	Freq- uency	% correct	Freq- uency	% correct	Freq- uency
85.00	2	60.00	1	87.50	1	80.00	1
90.00	2	65.00	1	90.00	2	82.50	1
92.50	2	72.50	1	92.50	2	85.00	2
95.00	2	80.00	1	95.00	4	87.50	2
97.50	13	82.50	1	97.50	13	90.00	2
100.00	19	85.00	1	100.00	18	92.50	5
Total	40	87.50	1	Total	40	95.00	3
		92.50	1			97.50	1
		95.00	7			100.00	6
		97.50	1			Total	23
		100.00	7				

Study 5 – Sections 3 & 4

Section 3 – L1		Section 3 – L2		Section 4 – L1		Section 4 – L2	
% correct	Freq- uency	% correct	Freq- uency	% correct	Freq- uency	% correct	Freq- uency
90.00	1	67.50	1	95.00	3	57.50	1
95.00	6	75.00	1	97.50	4	85.00	1
97.50	5	82.50	1	100.00	33	87.50	1
100.00	28	87.50	2	Total	40	92.50	1
Total	40	92.50	3			95.00	1
		95.00	2			97.50	5
		97.50	3			100.00	13
		100.00	10			Total	23
		Total	23				

Study 5 – Sections 5 & 6

Section 5 – L1		Section 5 – L2		Section 6 – L1		Section 6 – L2	
% correct	Freq- uency	% correct	Freq- uency	% correct	Freq- uency	% correct	Freq- uency
85.00	1	77.50	1	92.50	4	55.00	1
97.50	11	82.50	1	95.00	6	57.50	1
100.00	28	85.00	1	97.50	8	60.00	1
Total	40	87.50	2	100.00	22	77.50	1
		90.00	1	Total	40	80.00	2
		92.50	2			82.50	2
		95.00	4			87.50	2
		97.50	2			90.00	3
		100.00	9			92.50	3
		Total	23			97.50	3
						100.00	4
						Total	23

Study 5 – Section 7

Section 7 – L1		Section 7 – L2	
% correct	Freq- uency	% correct	Freq- uency
65.00	1	45.00	1
77.50	1	75.00	1
92.50	1	77.50	1
95.00	3	80.00	1
97.50	1	85.00	1
100.00	33	92.50	1
Total	40	95.00	1
		97.50	4
		100.00	12
		Total	23

Appendix 2 – Study 6 test and training materials

Appendix 2a. Test materials – sentence dications

Items for the initial test (33 items)

First set of 12 sentences

1. That book is yours and this book is ours.
2. He gave me my book and I gave him his.
3. If I knew where to go, I'd go right now.
4. Those data are so interesting. I wish they were ours.
5. I'd have gone there if I'd known where to go.
6. The results we've obtained show the theory to be correct.
7. Are those shoes yours? No, they're hers.
8. Would you have done anything differently if you'd had more time?
9. This should have been investigated, but we didn't have time.
10. Why didn't you ask him for directions?
11. This could've been investigated if more people had participated.
12. Would you have drunk more tea if it had been offered?

Following set of 21 sentences

1. Where've you put my books?
2. Where'd you studied before coming here?
3. I'd have helped you if I'd known you needed help.
4. This could've been researched better if more people'd participated.
5. Would you've read the book if I'd lent it to you?
6. We've obtained some results that show the theory to be valid.
7. If I knew where his office was, I'd go to talk to him.
8. She asked whether they'd already read the book.
9. We've always started at 8 am.
10. If he'd read the book first, he wouldn't 've enjoyed the film.
11. You've only visited me twice.
12. Where did you say you'd asked her to meet you?
13. What've you put there?

14. Where've you decided to go for your holiday?
15. If you'd left the book here, I'd 've borrowed it.
16. How could he've wuffed it if he hadn't already vuffed it?
17. If he'd only wuffed it first, he wouldn't 've had to vuff it.
18. Unfortunately, they've demonstrated their inefficiency.
19. I'd 've used the laptop if you'd left it for me.
20. They'd no idea where the books had come from.
21. I was sure I'd left the books on my desk.

Items for the final test (45 items)

1. That pen is ours.
2. He gave me his pen and I gave him mine.
3. If I knew what'd happened, I'd be able to help.
4. Those clothes are new, aren't they?
5. I'd have gone there if I'd known where to go.
6. If Paul hadn't been so preoccupied, he'd have seen the lorry.
7. If he'd seen the lorry coming towards him, he wouldn't have crashed into it.
8. After he'd lost his wife, he didn't know how to manage the children.
9. Would you have done anything differently if you'd had more help?
10. This should have been investigated, but we didn't have time.
11. Why didn't you ask him for information?
12. This could've been a different study if people had had more information.
13. Would you have done the test if it hadn't been compulsory?
14. Where've you put my keys?
15. Where'd you lived before moving here?
16. I'd have helped you if you'd asked me to.
17. This could've been researched better if more people'd participated.
18. Would you've read the book if I'd lent it to you?
19. We've obtained some additional resources.
20. If I knew where his office was, I'd go to talk to him.
21. She asked whether they'd already seen the film.
22. We've always eaten breakfast at 7.
23. If he'd read the book first, he wouldn't 've enjoyed the film.
24. You've only visited me once.
25. If Wellie hadn't met Jemima, he might not've known where he'd been found.
26. Where did you say you'd met your husband?

27. What've you done with my laptop?
28. Where've you decided to go next week?
29. I'd 've borrowed your umbrella if I could've found it.
30. How could he've wuffed it if he hadn't already vuffed it?
31. If he'd only wuffed it first, he wouldn't 've had to vuff it.
32. Unfortunately, they've not done what they should've.
33. I was sure I'd left my coat on the chair.
34. He said he'd only scratched the car a little.
35. If Paul'd been promoted, he wouldn't have kidnapped the children.
36. How could he've known what'd happened to him?
37. They asked whether she'd always lived there.
38. If he'd only cooked the meat first, he wouldn't have had food poisoning.
39. They'd have finished their work faster if they'd known what to do.
40. How many times have you done that?
41. She asked how many times he'd done it?
42. Could he've done it any better?
43. They might never've met, if they'd stayed home.
44. I'd 've marked the essays if you'd left them for me.
45. They'd no idea where the books had come from.

Appendix 2b. Training materials.

These start on the next page.

Conditional sentences – talking about the past

Something happened (or didn't happen) which caused something else to happen (or not to happen).

How could this have been different?

Examples:

1. Yesterday I forgot my note book, so I didn't have any paper to write lecture notes on.

If I hadn't forgotten my note book, I would have had some paper to write lecture notes on.

2. I met my new partner last year in the supermarket when we were both buying fish from the fish counter.

If I hadn't bought any fish in the supermarket on that day, I wouldn't have met my new partner.

If I had bought chicken instead of fish, my partner and I wouldn't have talked to each other.

If the sales assistant at the fish counter hadn't been so slow in serving us, my partner and I would have been served quickly, and we would not have had time to start talking.

Grammar:

If + past perfect, would (n't) have + past participle:

If I **had remembered** my note book, I **would have had** some paper.
(But I had forgotten my note book so I didn't have any paper.)

If I **had been** hungry, I **would have eaten** all my sandwiches.
(But I wasn't very hungry, so I didn't eat all my sandwiches.)

If I **hadn't been** late, I **wouldn't have** missed the bus.
(But I was late, and so I did miss the bus.)

How could the situations below have been different?

1. She missed her bus so she went to a café.
2. Someone had left a newspaper on one of the tables, so she sat down at that table with her cup of coffee so she could look at the newspaper while she waited.
3. She picked the newspaper up and idly looked at the job opportunities section.
4. She saw her dream job was being advertised.
5. In her excitement, she rushed out of the café forgetting to pay.
6. The café owner shouted, and a policeman grabbed her and arrested her.
7. Then she had a criminal record and could not apply for her dream job. Moreover, due to her arrest, she lost her own job.
8. The new house he bought needed painting, so he and his wife got to know the DIY store very well.
9. The apartment he bought was large, light and south facing with views of the sea, which made him feel very happy.
10. The cat scratched the wall paper, which meant that their landlord refused to give them back their deposit when they moved.
11. However, they loved the cat so they forgave it.
12. The researcher was delighted that they had volunteered to participate in the research project.

Example answers:

1. - If she hadn't missed her bus, she wouldn't have gone to the café.
 - She wouldn't have gone to the café if she hadn't missed her bus.
 - If she had left home earlier, she wouldn't have missed her bus and so she wouldn't have gone to the café to kill time while waiting for the next one.
2. - If someone hadn't left a newspaper at one of the tables, she might not have sat down at it.

Samples of training sentences.

1. We cd've played better. *(cd've = could have)*
2. We should've played better. *(should've = should have)*
3. We might've played better if we'd practised more. *(we'd = we had)*
4. We may've played better if we'd had better equipment. *(we'd = we had)*
5. If the weather'd been better, we'd 've gone to the beach.
(weather'd = weather had; we'd've = we would have)
6. Without your help, I wouldn't 've been able to complete the task easily.
(wouldn't 've been = would not have been)
7. If it'd snowed, we'd 've stayed home. *(it'd = it had; we'd've = we would have)*
8. We cd've done it faster. *(could have done)*
9. We should've done it faster. *(should have done)*
10. We might've done it faster if you'd already done your part. *(might have; you had)*
11. We may've done it faster if our boss'd given us permission to use the lab at the weekend.
(may have done; boss had given)
12. We'd definitely 've done it faster if we'd had the green light earlier.
(we would definitely have done; we had had)
13. If the weather'd been better, we'd 've sat outside. *(weather had; we would have sat)*
14. With your help, I'd 've been able to complete the task easily. *(I would have been)*
15. Without your help, it wd've been so much harder. *(it would have been)*
16. "My name's Jack Matthews. How do you do." he mumbled. *(My name is)*
17. "My name's Bridget Baker. How do you do." she replied. *(My name is)*
18. They shook hands. They'd sat next to each other during the last conference talk, but this was the first time they'd spoken to each other. *(they had; they had)*

v-w minimal pairs,

'd (*had*), 'd (*would*), 've (*have*), 'd 've (*would have*),

3rd conditional (*if he had gone home, he would have missed the = if he'd gone home, he'd 've missed the*)

I walked – I've walked – I'd walked – I was walking – I've been walking – I'd been walking

1. The vista from our window was wonderful.
2. The views of the waterfalls in the valley were outstanding.
3. We wished we'd (*had*) brought a camera.
4. If we'd (*had*) brought a camera, we'd 've (*would have*) taken some pictures.
5. The pictures would've been a lovely souvenir from our trip.
6. Wistfully we wished we'd (*had*) remembered the camera.
7. Whatever the weather the sight from the window remained glorious throughout our trip.
8. No matter whether it was calm and sunny or windy and rainy, we never tired of what we saw in the valley outside our window.
9. The sunset was what we appreciated the most – a scene that was second to none when the sky turned red and the sun turned orange.
10. But I suppose that even if we'd managed to take photos, we'd never really 've captured the vibrant glory.
11. Overall, my travel companions, Wendy, Veronica, Wesley, and I had a whale of a time.
12. Whenever we meet up and cast our minds back to our trip, our words come out in a whisper of awe at the wondrous sights that we saw.

1. If he'd stayed home on that fateful night, he wouldn't 've been caught up in the criminals' workings, and wouldn't 've caught the bullet in his knee.
2. If he hadn't been shot, he wouldn't have been admitted to hospital.
3. If he hadn't been admitted to hospital, he'd never have met Winifred who later became the love of his life.
4. He asked Winifred to marry him after only a week.
5. If Winifred hadn't been willing to wed him, he'd 've cried.
6. She was willing, and when she said yes, he cried anyway – but with tears of happiness.
7. Her answer'd (*had*) made him the happiest man alive!
8. He wonders what might 've happened to him if he'd stayed home on that fateful night.
9. We've vowed to make an enormous cake for their wedding.
10. We made a sumptuous cake for Winifred and Walter's wedding as promised.
11. It was covered with icing and we'd made little marzipan figures to decorate the top.
12. The decorations comprised a forest scene with trees, animals, and flowers, and we included figures of Walter and Winifred dancing under one of the trees.
13. As Winnie often said, it was lucky that that fateful night when Walter'd been shot hadn't in fact been a fatal night for him.
14. As it'd had always been her dream, they honeymooned in The Bahamas.
15. After they returned, they moved from the city to a small village.
16. We'd 've visited them if we could've, but we've been too busy.
17. However, we've heard that they've settled in to their new house well.
18. We've not forgotten that we've promised to visit as soon as we can.
19. How soon that'll be, we're not sure as we've such a busy schedule.

20. Our next topic brings us to what we've experienced.
21. We've never been to Japan but we've been to Thailand.
22. They've often talked of going to the North Pole but of course they've not been.
23. I've flown a plane but I haven't flown a hot-air balloon, nor have I been a passenger in one.
24. I've lived in Wimbledon and in Winchester but I'd 've preferred to 've (*have*) lived in the West Country than in south-west London.
25. Have you ever been to Brazil?
26. She asked whether he'd ever been to Brazil.
27. He wanted to know whether I'd finished writing my article.
28. Would you've gone with me to Westminster if you'd finished working on your vehicle?

N.B. The two sets of sentences above (12 + 28 sentences) were only used in Study 6 so that practise could include the /v/ - /w/ minimal pair.

Please also note that the number of sentences on each page has changed in the thesis due to the narrower margins. There were 18 sets of sentences on each sheet given to the participants. Here we have included samples from the sheets.

1. We've concluded the study and we've analysed the results.
2. They said they'd (*had*) analysed all the results carefully.
3. They've discovered three anomalies.
4. They wouldn't 've (*wouldn't* have) known what to do about the anomalies if their supervisor hadn't helped them.
5. If he'd been away, they'd 've been stuck.
6. Sunburn is not uncommon, but have you ever had windburn?
7. He fell over but was winded rather than hurt.
8. If you go up on the Downs, you'll see that the trees and bushes are windblown by the prevailing winds.
9. If we'd signed up for French classes instead of English ones, we wouldn't 've engaged in this study.
10. If we'd conducted a different study, we'd 've achieved something else.
11. They'd 've called us if they'd had our number.
12. I'd 've walked with you if you'd wanted me to.
13. You'd 've finished early yesterday if you hadn't had so much work.
14. She'd 've been the first to cross the finishing line if she'd kept up the pace.
15. But she wasn't able to keep up the pace until the very end, so she finished in third place.
16. If the doctor hadn't prescribed antibiotics, she might've been very ill.
17. Some people think the moon landings were a hoax.
18. If nobody's landed on the moon, it's about time they did.

1. He walked fast.
2. She walked faster.
3. He asked her where she was going.
4. She said she wasn't sure.
5. He asked her whether he *cd (could)* walk with her.
6. She replied that that'd be fine.
7. They strolled along together in silence.
8. They'd been walking for about 20 minutes when he broke the silence.
9. "Where are you from?" he asked.
10. She volunteered her name along with the name of the town where she'd been born.

The News (Midsummer's Eve, Wednesday 21st June, 2017). BBC 1.

1. The Queen's given her speech at the state opening of parliament today.
2. It was very short as the Prime Minister's had to ditch many of the things from her recent manifesto. Her position's been weakened by the recent election results.
3. Many of the key pledges from the Tory manifesto 've had to be left out of the Queen's speech.
4. The first of many inquests 've taken place for the victims of the Grenfell Tower disaster.
5. The Prince of Wales has visited the site of the attack in Finsbury.
6. The Queen's husband, the Duke of Edinburgh, has been admitted to hospital.
7. He is disappointed that his hospitalisation hasn't allowed him to attend the state opening of parliament nor the first day of Royal Ascot.
8. He'd very much 've liked to attend both.

9. It's been reported that the UK has the second highest infant mortality rate in Europe.
10. Today, Midsummer's Eve, has been the hottest June day recorded in the last 41 years. We've not had such a hot day in June since 1976.
11. Temperatures 've reached 33 degrees in London and 35 degrees around Heathrow.
12. Not all regions of the UK 've had such high temperatures.
13. Thunderstorms 've been forecast for tonight in some regions.
14. It's thought that the storms'll bring gusty winds and torrential rain.
15. There's even thought to be a possibility of hail.
16. This heatwave's made it difficult for people to sleep at night.
17. There's been a major cliff fall at Seaford Head this afternoon. It happened at around 4 pm. Part of the chalk cliff face has collapsed.
18. It's been reported that around 50 thousand tonnes of chalk 've fallen from the cliff onto the beach, but as that section of the beach is inaccessible, nobody's been injured. Even so, a search-and- rescue operation's been launched. Beach-goers 've been advised to stay away from the area.

The News (Midsummer's Day, Thursday 22nd June, 2017)

1. Inspections have been ordered at 600 blocks of flats after the Grenfell fire.
2. The number of tower blocks found to have combustible cladding similar to that used on Grenfell Tower, has risen to 11 across England.
3. 11 apartment blocks have so far been found to have been fitted with combustible cladding.
4. Downing Street has said that people will be rehoused if their building is found to be unsafe.
5. Theresa May has told European leaders at a summit in Brussels, that EU citizens will be allowed to stay in the UK after Brexit.

6. The Prime Minister has offered EU citizens currently in the EU the right to stay in the UK after Brexit.
7. She wants EU citizens who've made their home in the UK to have as much certainty as possible.
8. Prince Harry has commented that none of the royals want to wear the crown, but they'll do it out of royal duty.
9. The population of the UK has increased by more than half a million in the last couple of years.
10. This population rise is thought to have been driven by a mixture of more births, fewer deaths and some immigration.
11. Coastguards have carried out a further search-and-rescue operation after they'd received reports of a second cliff fall at Seaford Head.
12. A woman in a pink top had been seen walking on the cliff top immediately prior to the fall.
13. A long-awaited report into the troubled Southern rail franchise has blamed the unions for widespread disruption. The unions have responded that this is 'an attack on staff'.
14. The Department for Transport had said that the paper could not be published before the election a couple of weeks ago, but it has now made the paper public.
15. An independent review has found that senior figures in the Church of England 'colluded' with a former bishop who abused young men.
16. Although they'd known of allegations against him, they did nothing and allowed him to carry on working as a bishop. He's alleged to have abused 18 young men.
17. Hosting the British Cycling National Road Championships can help put the Isle of Man at the forefront of the world cycling, the event's director has said.
18. Olympic cycling champion Elinor Barker has swapped the cycling track for the road and is aiming for a medal in the National Road championships on the Isle of Man.

Appendix 3 – Study 7: samples of training materials that are additional to the Study 6 training materials & test materials

Appendix 3a. – samples of additional training materials included in Study 7.

The samples below are from the additional two sheets of training materials focusing on re-syllabification and intrusive semi-vowels:

1. They've been to South America several times, but they've only managed to travel to the African continent once even though some of their family live there.
2. They've been eating chocolate every evening since they got married, but they're struggling to remember exactly why this habit started.
3. He supposed the police parade would be an interesting event to photograph, so he took his camera with him when he went to watch it.
4. He took some photos, but if the police parade had been a bit more exciting, he'd have taken many more photos.
5. Some history books are dull, but others seem to bring history to life with vivid accounts of past events.
6. We can't be sure that all the events recorded in history books are correct.
7. However, we can be sure that history books'll give us lots of details about different royal families.
8. We don't know exactly why some people like to travel to new and distant places, but we can suppose that some do it because they're restless and want new adventures.
9. He said, 'Pay us the money you owe us. Please try to understand that that we need it to pay our university tuition fees'.
10. She replied, 'If I'd known you needed the money for your fees, I'd have returned it to you sooner'.
11. Would you be able to create a robot that could write a PhD thesis?
12. If you hadn't studied engineering, what would you have studied?

13. The world would be a less interesting place if there were no flowers outside and no art inside our buildings.
 14. 'How is it?' he asked, looking at her toy aeroplane, then added politely, 'And how are you?'
 15. 'Can we employ a professional photographer who has a sophisticated camera to take our wedding photos?' he asked.
 16. If my friend, whose husband is Spanish, hadn't learnt to speak Spanish, she'd have had trouble communicating with her in-laws.
 17. That's a comfortable chair. I wouldn't have bought it if it hadn't been so comfortable.
 18. If I hadn't forgotten to put my camera in my bag, I'd have had it with me at the media event.
-
1. If I'd had more time, I'd have eaten some vanilla ice cream.
 2. If I'd eaten some vanilla ice cream, I wouldn't have eaten any chocolate that evening.
 3. I asked whether I could help him, and he replied that that'd be good and it'd be very kind of me.
 4. He wouldn't have managed to finish his work if I hadn't helped him. It wasn't kindness on my part though. I did it as I wanted to ask for his help with something else.
 5. If we'd spent more time on our research, we'd have had better results.
 6. If we'd concentrated on what we were doing, we'd have noticed the errors sooner.
 7. The guest speaker would have included some film clips in his talk if he'd been more computer savvy.

Appendix 3b - test materials used in Study 7

Part 1b – additional morpheme recognition section for final test

Sentences

I think they added more	X 10
I think they've added more	X 10
I think they'd added more	X 10
I think they'd 've added more	X 10

Items

1. I think they added more
2. I think they've added more
3. I think they'd added more
4. I think they've added more
5. I think they've added more
6. I think they'd 've added more
7. I think they'd added more
8. I think they added more
9. I think they've added more
10. I think they'd 've added more
11. I think they added more
12. I think they added more
13. I think they'd 've added more
14. I think they'd 've added more
15. I think they'd added more
16. I think they'd added more
17. I think they'd added more
18. I think they added more
19. I think they'd 've added more
20. I think they added more
21. I think they'd added more
22. I think they've added more
23. I think they added more
24. I think they'd added more
25. I think they'd 've added more
26. I think they've added more
27. I think they'd added more
28. I think they added more
29. I think they'd 've added more
30. I think they'd 've added more

31. I think they'd 've added more
32. I think they'd added more
33. I think they've added more
34. I think they've added more
35. I think they'd added more
36. I think they'd 've added more
37. I think they added more
38. I think they added more
39. I think they've added more
40. I think they've added more

Part 2 – sentence dictations

Sentences for the final test

Items

1. Where've you put my books?
2. Where'd you studied before coming here?
3. I'd have helped you if I'd known you needed help.
4. This could've been researched better if more people'd participated.
5. Would you've read the book if I'd lent it to you?
6. We've obtained some results that show the theory to be valid.
7. If I knew where his office was, I'd go to talk to him.
8. She asked whether they'd already read the book.
9. We've always started at 8 am.
10. If he'd read the book first, he wouldn't 've enjoyed the film.
11. You've only visited me twice.
12. Where did you say you'd asked her to meet you?
13. What've you put there?
14. Where've you decided to go for your holiday?
15. If you'd left the book here, I'd 've borrowed it.
16. How could he've wuffed it if he hadn't already vuffed it?
17. If he'd only wuffed it first, he wouldn't 've had to vuff it.
18. Unfortunately, they've demonstrated their inefficiency.
19. I'd 've used the laptop if you'd left it for me.
20. They'd no idea where the books had come from.
21. I was sure I'd left the books on my desk.
22. We've always eaten breakfast at 7.
23. If he'd read the book first, he wouldn't 've enjoyed the film.
24. You've only visited me once.
25. If Wellie hadn't met Jemima, he might not've known where he'd been found.
26. Where did you say you'd met your husband?

27. What've you done with my laptop?
28. Where've you decided to go next week?
29. I'd 've borrowed your umbrella if I could've found it.
30. How could he've wuffed it if he hadn't already vuffed it?
31. If he'd only wuffed it first, he wouldn't 've had to vuff it.
32. Unfortunately, they've not done what they should've.
33. I was sure I'd left my coat on the chair.
34. He said he'd only scratched the car a little.
35. If Paul'd been promoted, he wouldn't have kidnapped the children.
36. How could he've known what'd happened to him?
37. They asked whether she'd always lived there.
38. If he'd only cooked the meat first, he wouldn't have had food poisoning.
39. They'd have finished their work faster if they'd known what to do.
40. Running is easier than jumping.

Sentences for the final test

Items

1. She's just walked seven kilometres.
2. If she hadn't switched the TV on, she wouldn't have seen the news.
3. If she hadn't seen the news, she wouldn't have heard that the Prime Minister had resigned.
4. She would've liked a cup of tea and a biscuit, but wasn't offered either.
5. I'd 've used the laptop if you'd left it for me.
6. He wouldn't have gone out if he'd known the storm was coming.
7. She asked how many times he'd done it.
8. I'd have helped if you'd asked me to.
9. They might never have met if they'd both stayed home.
10. Unfortunately, they've demonstrated their inefficiency.
11. They'd no idea where the books had come from.
12. I'd've marked the essays if you'd left them for me.
13. Could he've done it any better?
14. He'd have given me his blue pen if I'd given him my red one.
15. If I knew what had happened, I'd be able to help.
16. This should have been investigated but we didn't have time.
17. Why didn't you ask him for information?
18. Would you have done anything differently if you'd had more help?
19. This could've been a different study if people had had more information.
20. Where've you put my keys?
21. Would you have done the test if it hadn't been compulsory?
22. This could've been researched better if more people'd participated.
23. Would you've read the book if I'd lent it to you?
24. Would you have drunk more tea if it had been offered?
25. The children wanted to go to the park, but their parents had made other plans.
26. If you'd wanted more information, you should've asked for it.

27. How did you know he'd approached me about the job.
28. He didn't want any lunch because he'd had a large breakfast.
29. If he hadn't passed his exams, he'd have had to re-sit them.
30. She'd have been very pleased if he'd remembered to phone her.
31. They've already visited me in my new home.
32. Peter and Anna've invited me to their party.
33. If they hadn't invited me to their party, I'd have stayed at home.
34. Would you have danced if you hadn't liked the music?
35. He asked her if she'd ever experienced extremely cold weather.
36. If he'd lived in the city, he'd have used the bus to get to work.

Part 3 – E-Prime test sentences for comprehension

Sentences and questions for Set A

1. If it hadn't rained yesterday, I'd have gone for a long walk.

Did it rain yesterday?

2. If I hadn't brought my phone, I wouldn't have been able to phone for a taxi.

Did I bring my phone?

3. If Mr and Mrs Johnston hadn't had seven young children, they would have travelled around the world last year.

Did Mr and Mrs Johnston travel around the world last year?

4. He wouldn't have bought a bus pass if he'd lived close enough to the university to walk there.

Did he live close enough to the university to walk there?

5. If he'd eaten a variety of fruit and vegetables every day, he wouldn't have had a vitamin deficiency.

Did he have a vitamin deficiency?

6. The clothes I bought last year would have fit me if I hadn't lost weight.

Did last year's clothes still fit me?

7. He'd have travelled to Japan if he'd gone on holiday.

Did he go on holiday?

8. If she'd liked Peter, she wouldn't have avoided him.

Did she avoid Peter?

9. If he'd driven to work instead of cycling, he'd have been stuck in a traffic jam for a long time this morning.

Was he stuck in a traffic jam this morning?

10. She'd have gone on a sailing holiday with her friends if she hadn't had to work at the time.

Did she go on the sailing holiday with her friends?

11. If I hadn't learnt French at school, I wouldn't have studied it at university.

Did I learn French at school?

12. If the tennis player hadn't won his last match, he'd have given up playing tennis professionally last summer.

Did the tennis player give up playing tennis professionally last summer?

13. The students wouldn't have gone to the library if they hadn't needed a quiet place to study.

Did the students need a quiet place to study?

14. He'd have done more reading if he hadn't fallen asleep at his desk.

Did he fall asleep at his desk?

15. She'd have helped him if he'd asked her to.

Did he ask her to help him?

16. If I'd got up earlier, I'd have gone for a swim before going to the university.

Did I get up early enough to go for a swim?

17. I wouldn't have chosen the orange hat if I'd had a choice.

Did I choose the orange hat?

18. If he'd done some reading before he set up his research project, he'd have designed it better.

Did he do any reading before starting his project?

19. If he hadn't gone to the shops, he wouldn't have bought any chocolate.

Did he buy any chocolate?

20. If the lecturer had been ill yesterday, we wouldn't have had to come to the university for a class.

Was the lecturer ill yesterday?

21. If he'd been able to drive, he'd have driven to Germany to drive on the German motorways.

Did he drive to Germany?

22. Mr Smith wouldn't have been run over if he'd looked before crossing the road.

Was Mr Smith run over?

23. The university wouldn't have promoted the lecturer, if she hadn't produced such good research papers.

Did the university promote the lecturer?

24. If the café had been open, she'd have bought a cup of coffee.

Was the café open?

25. He wouldn't have taken a ride on the rollercoaster if he'd known it would make him feel sick.

Did he take a ride on the roller coaster?

26. If he hadn't trained hard for the marathon, he wouldn't have been able to complete it.

Was he able to complete the marathon?

27. If I'd eaten too much breakfast, I wouldn't have wanted any lunch.

Did I eat too much breakfast?

28. She wouldn't have become friends with him if he hadn't been such a nice person.

Did she become friends with him?

29. We'd have invited you to join our study group if you hadn't already been working with Tom and Anna.

Did we invite you to join our group?

30. If she'd finished her project on Friday, she wouldn't have had to work all weekend.

Did she finish her project on Friday?

31. If she'd forgotten her student card, she wouldn't have been able to get into the library easily.

Did she forget her student card?

32. If she'd remembered her boyfriend's birthday, she'd have organised a surprise party for him.

Did she remember her boyfriend's birthday?

33. I wouldn't have enjoyed the party if my friend hadn't come with me.

Did my friend come with me to the party?

34. They wouldn't have applied for a financial loan if they'd had enough money.

Did they have enough money?

35. He wouldn't have felt so stressed if he'd finished his work before the deadline.

Did he finish his work before the deadline?

36. He'd have attended the lecture if he hadn't arrived late.

Did he arrive late?

37. If she'd won the lottery last week, she'd have quit her job.

Did she quit her job?

38. If the hairdresser hadn't been good at her job, her customers wouldn't have kept coming back for more appointments.

Did the hairdresser's customers keep coming back?

39. If she hadn't wanted to go on the trip to Cambridge, she'd have said no to going.

Did she say no to going on the trip?

40. He'd have forgotten his mother's birthday if he hadn't written it on his calendar.

Did he write his mother's birthday on his calendar?

41. She wouldn't have ordered a takeaway pizza if she hadn't been very hungry.

Was she very hungry?

42. If the university hadn't accepted me as a student, I'd have tried to find a job.

Did the university accept me as a student?

43. He wouldn't have been able to solve the problem quickly if he hadn't taken time to reflect on it first.

Was he able to solve the problem quickly?

44. Mr Johnston wouldn't have knitted a sweater for Mrs Johnston if he hadn't enjoyed knitting.

Did Mr Johnston knit a sweater for Mrs Johnston?

45. If the professor hadn't explained the subject well, the students wouldn't have understood it.

Did the professor explain well?

46. She wouldn't have bought the red car if she'd had to pay the full price for it.

Did she buy the red car?

47. The circus artiste would have fallen five meters to the ground if she'd slipped off the swing.

Did she fall five meters to the ground?

48. If the students hadn't worked hard, they'd have failed their exams.

Did the students work hard?

49. The dog would have eaten the cat's food if it had had the chance.

Did the dog eat the cat's food?

50. If Maria hadn't found a job quickly, she'd have been worried about money.

Did Maria find a job quickly?

51. If she hadn't slept well last night, she wouldn't have come to work this morning.

Did she come to work this morning?

52. I'd have passed the course if I'd submitted my course work on time.

Did I pass the course?

53. I'd have bought a horse if I'd had a place for it to live.

Did I buy a horse?

54. He'd have gone to the party if she'd invited him.

Did she invite him to the party?

55. If Anna hadn't studied business, she wouldn't have become a manager.

Did Anna study business?

56. If they'd known where the bank was, they wouldn't have asked for directions.

Did they ask for directions to the bank?

57. If he hadn't attended Sussex University and lived in Brighton when he was a student, he'd have lived and studied in London.

Did he study in London?

58. She'd have asked the lecturer for a tutorial if she hadn't understood the assignment.

Did she understand the assignment?

59. If he'd found his key, he wouldn't have called the locksmith.

Did he call the locksmith?

60. They wouldn't have been late if the bus had been on time.

Was the bus on time?

61. They wouldn't have enjoyed the course if the lecturer hadn't made it interesting.

Did the lecturer make the course interesting?

62. I'd have gone to the beach yesterday if it'd been warm and sunny.

Was it warm and sunny yesterday?

63. If the film had been boring, we'd have left the cinema before it ended.

Did we leave the cinema before the film ended?

64. She'd have cooked dinner for her friends yesterday if they hadn't been so late.

Did she cook dinner for her friends yesterday?

Sentences and questions for Set B

1. If it hadn't rained so hard yesterday, I'd have gone for a walk.

Did I go for a walk yesterday?

2. The students wouldn't have been able to complete the assignment quickly if they hadn't understood it.

Did the students understand the assignment?

3. If we'd had a cat, the birds wouldn't have built nests in our garden.

Did some birds build nests in our garden?

4. If my car had been orange in colour, it would have been easier to see in the car park.

Was my car orange in colour?

5. I wouldn't have been able to phone for take-away food if I hadn't brought my phone with me.

Did I bring my phone?

6. My sister wouldn't have wanted a piece of my homemade cake if she'd eaten too much lunch earlier.

Did my sister eat too much lunch?

7. They wouldn't have enjoyed the course if the lecturer hadn't taught it well.

Did they enjoy the course?

8. If he'd been 2 meters tall, he'd have been able to reach the back of the top shelves in the supermarket without help.

Was he able to reach the back of the top shelves in the supermarket without help?

9. He'd have climbed to the top of the mountain if he hadn't been afraid of heights.

Did he climb to the top of the mountain?

10. He'd have gone outside if he'd wanted to see the view of the mountains.

Did he want to see the view?

11. If Tom'd come to the lecture yesterday, he'd have understood the topic better.

Did Tom come to the lecture yesterday?

12. If the Professor hadn't been careful with his explanations, he'd have confused the students.

Did the Professor confuse the students?

13. The President wouldn't have appointed Adam Smith as his advisor if they'd gone to college together.

Did the President and Adam Smith go to college together?

14. She wouldn't have bought the bouquet of flowers if they hadn't been fresh.

Was the bouquet of flowers fresh?

15. If the supervisor hadn't listened carefully, he wouldn't have understood the student's problem.

Did the supervisor understand the student's problem?

16. If the library'd been open when I got there yesterday, I'd have borrowed some books.

Did I borrow some books yesterday?

17. He'd have been very tired from all his work if he hadn't taken a break.

Did he take a break?

18. If she'd been looking at her mobile phone, she wouldn't have noticed the cute guy smiling at her.

Did she notice the cute guy smiling at her?

19. If he'd been on a diet, he wouldn't have eaten three chocolate bars before breakfast.

Did he eat three chocolate bars before breakfast?

20. The student wouldn't have gone to see his tutor if he'd understood the assignment questions.

Did the student go to see his tutor?

21. If Anna'd enjoyed playing football, she'd have played with the local team on Saturdays.

Did Anna play football with the local team on Saturdays?

22. If Mr Johnston had been good at knitting, Mrs Johnston would have worn the sweaters that he knitted for her.

Did Mrs Johnston wear the sweaters that her husband knitted for her?

23. If Tom had won the lottery, he'd have bought an aeroplane.

Did Tom win the lottery?

24. The students wouldn't have stayed home yesterday if they'd had a class.

Did the students have a class yesterday?

25. He wouldn't have travelled to London if he hadn't finished his assignment before the deadline.

Did he travel to London?

26. If the girl hadn't been nice to the other children, they wouldn't have liked her.

Did the other children like the girl?

27. They'd have gone to the Italian restaurant if they hadn't gone to the Brazilian restaurant.

Did they go to the Italian restaurant?

28. If Stephen hadn't met Mary before he broke his leg, they wouldn't have learnt to dance together.

Did Stephen and Mary learn to dance together?

29. If my friend Maria hadn't remembered my birthday, I'd have been sad.

Did Maria remember my birthday?

30. The footballer wouldn't have been able to play football if he'd had a knee or foot injury.

Was the footballer able to play football?

31. Mr Johnston would've been hurt if he'd been in a car accident.

Was Mr Johnston in a car accident?

32. If it hadn't snowed last winter, I wouldn't have been able to go skiing?

Did I go skiing?

33. They'd have travelled to London if they hadn't had to work all weekend.

Did they have to work all weekend?

34. David would have taken Anna to the football match if she hadn't hated football.

Did Anna dislike football?

35. Tom wouldn't have visited his parents every weekend if he hadn't had a car.

Did Tom have a car?

36. If it had been cold last weekend, I wouldn't have gone to the beach.

Was it cold last weekend?

37. If the university hadn't offered accommodation on campus to the international students, some of the students wouldn't have come here to study.

Did the university offer accommodation to the international students?

38. If my research experiment hadn't worked, I wouldn't have had any data for my report.

Did my experiment work?

39. If he hadn't had a dog, he wouldn't have gone for any walks in the park.

Did he have a dog?

40. If David hadn't listened to the carefully to the advice the professor gave him, he wouldn't have been able to complete his assignment.

Did David listen carefully?

41. He'd have stopped studying if the coursework had been too difficult.

Did he stop studying?

42. He wouldn't have eaten fresh fish every day if he hadn't lived by the sea.

Did he eat fresh fish every day?

43. If she'd left her house on time, she wouldn't have missed the train.

Did she leave on time?

44. If John'd been promoted at work, he wouldn't have been so angry.

Was John promoted?

45. The dog would have chased the cat if the cat had been afraid of it.

Did the dog chase the cat?

46. The mouse would have run if the cat had chased it.

Did the cat chase the mouse?

47. She'd have conducted a second experiment if the first one hadn't been successful.

Did she conduct a second experiment?

48. If Tom'd applied to study Mathematics at university, he'd have wanted to study at Edinburgh University.

Did Tom apply to study Mathematics?

49. If we hadn't been ill, we'd have attended the concert.

Did we attend the concert?

50. They wouldn't have ordered take-away food if they'd had time to go to the supermarket to shop.

Did they order take-away food?

51. She'd have read her new book at home yesterday evening if she hadn't left it in her office.

Did she read the new book yesterday evening?

52. She wouldn't have bought the shoes if they'd cost more than £40.

Did she buy the shoes?

53. If the shop'd had more customers, it wouldn't have closed down.

Did the shop close down?

54. She'd have bought the table if it had been big enough to seat 8 people.

Did she buy the table?

55. If the boy hadn't been shy, he'd have asked the girl to dance with him.

Was the boy shy?

56. If the washing machine hadn't broken, I'd have washed my clothes.

Did the washing machine break?

57. He'd have travelled around America if he'd gone on holiday.

Did he go on holiday?

58. I wouldn't have studied Spanish at evening class if I'd had the chance to learn it at school.

Did I learn Spanish at school?

59. If the cyclist hadn't cycled slowly in the city centre, she'd have had an accident.

Did the cyclist have an accident?

60. He'd have enjoyed learning to dance if he'd had time to do it.

Did he have time to learn to dance?

61. If Hilary hadn't liked cycling on her new bicycle, she'd have come to work by car.

Did Hilary like cycling?

62. If the Head of Department had broken his leg on holiday, he wouldn't have come back for the first day of the new academic year.

Did the Head of the Department break his leg on holiday?

63. The student would've bought a cup of hot chocolate if the café' hadn't been closed.

Was the café open?

64. She wouldn't have given her boyfriend a birthday present if she hadn't known what he wanted.

Did she give her boyfriend a birthday present?